Electricity, Electronics & Control Engineering

ID #	Question	Choice A	Choice B	Choice C	Choice D
1	"Low Voltage Release" (LVR) protection used in some shipboard motor starters and other control equipment will have which of the following characteristics?	The controller will trip the circuit contactors when motor over-speed occurs.	The controller will require manual resetting upon restoration of normal voltage.	The controller uses a phase sensitive relay to trip contacts in series with the holding coil of the starter.	**The controller will allow a motor to automatically restart upon restoration of normal voltage.**
2	A 120 volt battery is rated at 800 amp-hours for a continuous 50 kW load. Approximately how long will the fully charged battery be able to supply a continuous 50 kW load before the battery can no longer maintain this discharge rate and is effectively discharged?	60 minutes	75 minutes	90 minutes	**115 minutes**
3	A 125 volt DC motor is rated at 10 kW. What is the current rating of the motor?	4.6 amps	8.0 amps	46.2 amps	**80 amps**
4	A 4160 Volt AC generator is loaded to 2850 kW with a 0.85 power factor. What is the approximate kVAR load on the generator?	503 kVAR	**1766 kVAR**	2850 kVAR	3353 kVAR
5	A basic electrical meter sensing device that responds to the flow of current through an electromagnetic coil commonly used in DC ammeters, voltmeters, and ohm meters is referred to as a particular type of movement. What is the proper name for this movement?	**D'Arsonval meter movement**	Bourdon meter movement	Vibrating Reed movement	Transducer meter movement
6	A battery is connected to a circuit containing three resistors in parallel. The values of the three resistors are 2 ohms, 3 ohms, and 6 ohms. What is the voltage of the battery if the total circuit current is 12 amps?	2 volts	6 volts	**12 volts**	24 volt
7	A capacitive AC circuit has fixed capacitors connected in series. If the line voltage remains constant, what factor can allow the capacitive reactance of the circuit to be varied?	**line frequency**	resistance of the capacitors	order of the capacitors	polarity of the capacitors
8	A capacitor can be tested using a megohmmeter, an ohmmeter, or a digital multimeter. If a digital multimeter set up as an ohmmeter is connected to a shorted capacitor, what would the display indicate?	The screen would immediately display a resistance value of OL and then remain at OL.	The screen would immediately display a very low resistance value then gradually increase to OL.	**The screen would immediately display a very low resistance value then remain at this value.**	The screen would immediately display a resistance value of OL then gradually decrease to a very low resistance value.

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9	A capacitor is to be tested with a digital multimeter set up to measure ohms. If the meter is connected to a shorted capacitor, how would the meter display respond?	immediately display a value of OL which remains at OL	**immediately display a very low resistance value which remains low**	immediately display a value of OL with the value then continuously dropping to a low value	immediately display a very low resistance with the value then continuously rising to a value of OL
10	A carbon resistor has a resistance of 50 ohms, and a tolerance of 5 percent. What would be the respective colors indicated for bands 1, 2, 3 and 4 for this resistor as shown in figure "A" of the illustration?	gray, black, brown, and silver.	green, black, black, and silver.	gray, black, brown, and gold.	**green, black, black, and gold.**
11	A carbon resistor has the following color bands; band 1 is yellow, band 2 is violet, band 3 is black, and band 4 is gold. What is the ohmic value of the resistor, as well as the tolerance?	**47 ohms + or - 5%**	7400 ohms + or - 10%	47,000 ohms + or - 5%	740,000 ohms + or - 10%
12	A carbon resistor has the following color bands; band 1 is yellow, band 2 is violet, band 3 is gold, and band 4 is silver. What is the ohmic value of the resistor, as well as the tolerance?	**4.7 ohms + or - 10%**	47 ohms + or - 5%	4700 ohms + or - 10%	4.7 K ohms + or - 5%
13	A carbon resistor has the following color bands; band 1 is yellow, band 2 is violet, band 3 is orange, and band 4 is silver. What is the ohmic value of the resistor, as well as the tolerance?	47 ohms + or - 10%	7400 ohms + or - 5%	**47,000 ohms + or - 10%**	740,000 ohms + or - 5%
14	A carbon resistor has the following color bands; band 1 is yellow, band 2 is violet, band 3 is yellow, and band 4 is silver. What is the value of the resistor in ohms, as well as the tolerance?	74 ohms + or - 5%	4700 ohms + or - 10%	74,000 ohms + or - 5%	**470,000 ohms + or - 10%**
15	A circuit that has a conductor in electrical contact with the hull of a ship is called what?	**grounded circuit**	short circuit	series circuit	closed circuit
16	A coil is wound with 200 feet of No. 16 tinned copper wire and connected to a 12 volt battery. What is the current if the resistance per 1000 feet of No. 16 tinned copper wire is 4.26 ohms?	1.14 amps	7.04 amps	10.22 amps	**14.08 amps**
17	A coil is wound with 400 feet of No. 16 tinned copper wire and connected to a 12 volt battery. What is the current if the resistance per 1000 feet of No. 16 tinned copper wire is 4.26 ohms?	4.8 amps	**7.04 amps**	10.65 amps	11.27 amps
18	A common method used to control the speed of a synchronous AC propulsion motor on a diesel-electric propulsion drive is by what means?	**varying the input frequency of the voltage to the motor**	increasing the motor voltage	decreasing the motor voltage	increasing the current to the motor
19	A common-emitter circuit has an input voltage of 0.1 volt, an output voltage of 2.0 volts, an input current of 0.5 milliamps, and an output current of 10 milliamps. What is the power gain?	20	40	**400**	4000

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20	A compound wound DC generator has a no-load voltage of 250 volts and a full-load voltage of 230 volts. What type of compounding characteristic is indicated?	flat compounded	over compounded	**under compounded**	terminal compounded
21	A container unit's microprocessor-controlled temperature controller is set at -28.9 ° C, appropriate for a frozen cargo of ice cream. In this mode of operation, according to the illustrated temperature controller functional diagrams, what features are locked out?	modulating cooling only	heating only	**modulating cooling and heating**	air circulation only
22	A container unit's microprocessor-controlled temperature controller is set at -28.9 ° C, appropriate for a frozen cargo of ice cream. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is -18.0 ° C?	modulating cooling mode	**cooling mode**	air circulation mode	heating mode
23	A container unit's microprocessor-controlled temperature controller is set at -28.9 ° C, appropriate for a frozen cargo of ice cream. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is -30.0 ° C?	modulating cooling mode	cooling mode	**air circulation mode**	heating mode
24	A container unit's microprocessor-controlled temperature controller is set at 8.9 ° C, appropriate for a chilled perishable cargo of limes. In this mode of operation, according to the illustrated temperature controller functional diagrams, what features are locked out?	modulating cooling only	heating only	modulating cooling and heating	**cooling only**
25	A container unit's microprocessor-controlled temperature controller is set at 8.9 ° C, appropriate for a perishable chilled cargo of ice limes. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is 10.1 ° C?	**modulating cooling mode**	cooling mode	air circulation mode	heating mode

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26	A container unit's microprocessor-controlled temperature controller is set at 8.9 ° C, appropriate for a perishable chilled cargo of limes. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is 6.3 ° C?	modulating cooling mode	cooling mode	air circulation mode	**heating mode**
27	A current-carrying conductor makes accidental contact with a wiring conduit. How will this be indicated on the switchboard, as compared to indications when the situation is normal, assuming that the distribution system is an ungrounded system?	lower switchboard wattmeter reading than normal	higher switchboard voltmeter reading than normal	**darkened switchboard ground detecting lamp**	darkened switchboard synchronizing lamps
28	A current-carrying conductor making electrical contact with a wiring conduit will be indicated by a change on the switchboard from the norm. Assuming that the distribution system is an ungrounded system, what will change?	higher switchboard wattmeter reading than normal	**totally dark switchboard ground detecting light**	lower switchboard wattmeter reading than normal	higher voltmeter reading than normal
29	A DC generator which is used to supply direct current in order to provide magnetizing current to an AC generator field is commonly known as what?	rotor	stator	**exciter**	armature
30	A degree of control over the speed of a slip ring induction motor can be obtained by what means?	adjusting governor linkage	changing the number of phases to the motor	inserting resistance into the stator circuit	**inserting resistance into the rotor circuit**
31	A delayed-action fuse is most frequently used in which of the listed circuits?	Ships main lighting circuits	**Large induction motor circuits**	Battery charging circuits	Navigation light circuits
32	A digital multimeter is set up as an ohmmeter on the 1 kohm scale. What does a display reading of 'OL' ohms as read across the ends of a wire conductor indicate?	**open circuit**	a partial ground	a partial short	continuity
33	A digital multimeter is set up as shown in the illustration to evaluate the single-circuit stator windings of a squirrel cage induction three-phase motor. The following readings are taken: From T1 to T2 reads "OL" ohms. From T2 to T3 reads "OL" ohms. From T3 to T1 as shown reads "1.6" ohms. What condition is indicated?	Phase A (associated with T1) and Phase C (associated with T3) are undamaged. Phase B (associated with T2) is short-circuited.	**Phase A (associated with T1) and Phase C (associated with T3) are undamaged. Phase B (associated with T2) is open-circuited.**	Phase A (associated with T1) and Phase C (associated with T3) are short-circuited. Phase B (associated with T2) is undamaged.	Phase A (associated with T1) and Phase C (associated with T3) are open-circuited. Phase B (associated with T2) is undamaged.

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34	A digital multimeter is set up as shown in the illustration to evaluate the single-circuit stator windings of a squirrel cage induction three-phase motor. The following readings are taken: From T1 to T2 reads 0.8 ohms. From T2 to T3 reads 0.8 ohms. From T3 to T1 as shown reads 1.6 ohms. What condition is indicated?	**Phase A (across T1 and T2) and Phase B (across T2 and T3) are undamaged. Phase C (across T3 and T1) is open-circuited.**	Phase A (across T1 and T2), Phase B (across T2 and T3), and Phase C (across T3 and T1) are undamaged.	Phase A (across T1 and T2) and Phase B (across T2 and T3) are open-circuited. Phase C (across T3 and T1) is undamaged.	Phase A (across T1 and T2), Phase B (across T2 and T3), and Phase C (across T3 and T1) are open-circuited.
35	A digital multimeter is set up as shown in the illustration to evaluate the single-circuit stator windings of a squirrel cage induction three-phase motor. The following readings are taken: From T1 to T2 reads 1.6 ohms. From T2 to T3 reads "OL" ohms. From T3 to T1 as shown reads "OL" ohms. What condition is indicated?	Phase A (associated with T1) and Phase B (associated with T2) are short-circuited. Phase C (associated with T3) is undamaged.	Phase A (associated with T1) and Phase B (associated with T2) are open-circuited. Phase C (associated with T3) is undamaged.	Phase A (associated with T1) and Phase B (associated with T2) are undamaged. Phase C (associated with T3) is short-circuited.	**Phase A (associated with T1) and Phase B (associated with T2) are undamaged. Phase C (associated with T3) is open-circuited.**
36	A digital multimeter is set up as shown in the illustration to test an individual element of a three-phase immersion heater. The elements are connected across terminals 1 and 4, 2 and 5, and 3 and 6 as shown. The reading across terminals 1 and 4 is 32 ohms. The reading across terminals 2 and 5 is 32 ohms. The reading across terminals 3 and 6 as shown is "OL" ohms. What is condition is indicated?	The element across terminals 3 and 6 is short-circuited. The other two elements are functioning properly.	**The element across terminals 3 and 6 is open-circuited. The other two elements are functioning properly.**	The element across terminals 3 and 6 is functioning properly. The other two elements are short-circuited.	The element across terminals 3 and 6 is functioning properly. The other two elements are open-circuited.
37	A digital multimeter set up to read AC volts is calibrated to read what type of voltage?	instantaneous voltage	average voltage	**RMS (root mean square) voltage**	peak voltage
38	A digital multimeter, set up as a milliammeter on the 100 milliamp scale, is known to have an accuracy of plus or minus 2%. A display reading of 10.0 milliamps would indicate an actual line current between what two values?	9.8 and 10.0 milliamperes	**9.8 and 10.2 milliamperes**	8.0 and 12.0 milliamperes	8.0 and 10.0 milliamperes
39	A digital multimeter, set up as a milliammeter on the 100 milliamp scale, is known to have an accuracy of plus or minus 2%. A meter reading of 5.0 milliamps would indicate an actual line current between what two values?	**4.9 and 5.1 milliamperes**	4.8 and 5.2 milliamperes	4.5 and 5.5 milliamperes	4.0 and 6.0 milliamperes
40	A direct current passing through a wire coiled around a soft iron core is known as what?	magnetic shield	**electromagnet**	piezoelectric device	electromagnetic domain
41	A four pole turbo generator is used in conjunction with a 160 pole propulsion motor. If the generator is turning at 3,200 RPM, what is the current speed of the propeller?	40 RPM	60 RPM	**80 RPM**	100 RPM

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42	A four pole, 60 Hz, three-phase synchronous motor comes up to 1760 RPM when started as an induction motor. What is the percent slip after the rotor field is energized?	**0.0**	1.1	2.2	3.3
43	A four-pole 60-hertz induction motor has a synchronous speed of 1800 RPM and a slip of 4 percent at full load. What will be its full load speed?	**1728.0 RPM**	1730.7 RPM	1800.0 RPM	1872.0 RPM
44	A four-pole induction motor, operating on three-phase 60 cycle current will operate at approximately _____.	850 RPM	1,150 RPM	**1,750 RPM**	3,550 RPM
45	A four-pole, 60 cycle, squirrel-cage motor has a full load speed of 1725 RPM. What will be the percent of slip at full load?	**4.16**	4.34	95.66	95.84
46	A full-wave rectifier has one diode burned out in an open condition, what will be the output characteristic of the device?	Zero	**Half-wave rectified**	Full-wave rectified	Equal to the AC input
47	A general purpose electrical multimeter can be used to directly measure what value?	watts	field flux	**current**	reactance
48	A generator has been exposed to water and needs to be checked before it can be operated safely. After performing the necessary procedures for drying the generator, what test needs to be performed before safe operation can resume?	check for shorted coils with a growler	take moisture readings with a hydrometer	**test insulation values with a megger**	ground the commutator, or slip rings and run it at half load for 12 hours
49	A ground is indicated by the ground-detecting system on the main electrical switchboard. What is the FIRST step in locating the actual ground?	close all circuit breakers in the distribution panel until the ground detector indicates normal	**open the individual circuit breakers, one by one until the ground detection system indicates normal**	change over generators	check each circuit with a megohmmeter
50	A high-pressure centrifugal chiller currently charged with R-134a is being evaluated for the need for leak testing. Using the leak-test procedures decision tree illustrated and the R-134a pressure-temperature chart illustrated, with the machine idle and the pressures equalized at 10 psig with an ambient temperature of 60 ° F, what statement is true?	The machine definitely does not have a leak, therefore no attempt at leak detection is necessary.	The machine may or may not have a leak, therefore the machine should be checked for leaks without any adjustments in pressure.	**The machine has a suspected leak, therefore the refrigerant pressure should be raised to 35 psig by adding refrigerant prior to checking for leaks.**	The machine has a suspected leak, therefore nitrogen should be added to bring the pressure to 70 psig prior to checking for leaks.

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51	A high-pressure centrifugal chiller currently charged with R-134a is being evaluated for the need for leak testing. Using the leak-test procedures decision tree illustrated and the R-134a pressure-temperature chart illustrated, with the machine idle and the pressures equalized at 57.4 psig with an ambient temperature of 60 ° F, what statement is true?	The machine definitely does not have a leak, therefore no attempt at leak detection is necessary.	**The machine may or may not have a leak, therefore the machine should be checked for leaks.**	The machine definitely has a leak, therefore the refrigerant pressure should be reduced to 35 psig prior to checking for leaks.	The machine definitely has a leak, therefore nitrogen should be added to bring the pressure to 70 psig prior to checking for leaks.
52	A lamp has a source voltage of 110 volts and a current of 0.9 amps. What is the hot resistance of the lamp filament?	0.008 ohms	0.08 ohms	12.22 ohms	**122.22 ohms**
53	A lamp is provided with 110 volts and draws a current of 0.8 amps. What is the hot resistance of the lamp filament?	12.2 ohms	88.0 ohms	122.2 ohms	**137.5 ohms**
54	A load is connected across the secondary of a step up power transformer and the current drawn by the load is 10 amps. If the transformer has a turns ratio of 1 to 10 and the input voltage to the primary is 110 VAC, what will be the current flow through the primary?	1 amp	10 amps	**100 amps**	1000 amps
55	A load is connected across the secondary of the step up transformer shown in figure "B" of the illustration and the current drawn by the load is 10 amps. If the turns ratio is 1 to 10 and the input voltage is 110 VAC, what will be the current drawn by the primary?	1 amp	10 amps	**100 amps**	1000 amps
56	A load with an impedance of 440 ohms is connected across the secondary of a step-up transformer. If the input voltage is 110 VAC and the turns ratio is 1 to 10, what will be the primary current?	2.5 amps	**25 amps**	250 amps	current cannot be determined with information given
57	A load with an impedance of 440 ohms is connected across the secondary of the step up transformer shown in figure "B" of the illustration. If the input voltage is 110 VAC and the turns ratio is 1 to 10, what will be the primary current?	2.5 amps	**25 amps**	250 amps	current cannot be determined with information given
58	A loud buzzing noise at the contacts of a magnetic controller could indicate what condition?	weak contact spring pressure	**misalignment of the magnet faces**	excessive line current	mechanical binding
59	A loud buzzing noise coming from the contacts in a magnetic controller can be caused by what condition?	excessive current	excessive magnet gap	bouncing of contacts	**dirt on magnet faces**

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60	A low voltage source is applied to the collector rings of a salient-pole alternator to test for shorted coils. As the voltage drop across each coil is recorded, what would be the indication of a short-circuited coil?	high voltage reading, while the other coil readings will have an equal or lower value	**low or zero voltage reading, while the other coils will have higher readings**	fluctuating voltmeter reading, while the other coil readings are steady	steady voltmeter reading, while the other coil readings are fluctuating
61	A main switchboard for an AC electrical distribution system is different from a main switchboard for a DC distribution system in that it will be provided with which of the following meters?	**Frequency meter**	Ammeter	Voltmeter	Kilowatt meter
62	A main switchboard synchronizing panel is fitted with two synchronizing lamps and a synchroscope. When paralleling, if the synchroscope pointer is at the noon position and one synchronizing light is bright while the other remains dark, what does this indicate?	the incoming generator voltage is too low	**the generators are out of phase sequence and one lamp is burned out**	the generators are in phase sequence but one lamp is burned out	the generator breaker may be closed
63	A megger is being used to test the insulation of an AC generator. What will be the measured resistance value of a dry, clean winding?	**continue to rise as test potential is maintained, becoming fairly steady as the dielectric-absorption effect of insulation stabilizes**	remain constant as the temperature of the windings increases	continue to drop as test potential is maintained, becoming fairly steady after 5-7 minutes	stabilize after approximately 2-4 minutes of fluctuation
64	A megohmmeter is connected to opposite ends of an individual motor winding. What would a low ohm reading indicate?	an open coil	a loose coil	**good continuity**	a dirty coil
65	A motor controller contains three selector push buttons labeled 'start', 'jog', and 'stop'. What will happen to the motor when the 'jog' button is depressed?	will run continuously after the 'jog' button is released	**will run until the 'jog' button is released**	will not start until both the 'jog' and 'start' buttons are pushed	will not stop unless the 'stop' button is pushed
66	A nickel-cadmium battery is receiving a normal charge and gases freely. What should be done in terms of the charging current?	it should be increased	it should be decreased	it should be cut off and the battery allowed to cool	**it should remain the same**
67	A resistance in a circuit of unknown value is to be tested using the voltmeter/ammeter method. How should the two meters be connected?	both meters in series with the resistance	both meters in parallel with the resistance	**the ammeter in series and the voltmeter in parallel with the resistance**	the ammeter in parallel and the voltmeter in series with the resistance
68	A saturable-core reactor operates on the principle of controlling a load winding's inductance by changing the permeability of the core. How is this accomplished?	varying the core's dielectric strength	**varying the core's saturation**	varying the core's reactance	varying the core's inductance
69	A shaded-pole motor is a specific type of motor included in what class of motor?	polyphase synchronous motor	three-phase induction motor	DC compound-wound motor	**single-phase induction motor**

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70	A ships main propulsion electric drive power converter panel circuit breaker may fail to close due to the action of various electrical interlocks via shunt trips. What permissive circuit/electrical interlock would most likely be the cause?	**power converter cooling fan not energized**	shaft control throttle handles in "stop" position	shaft brake not set	control panel door closed
71	A shown in figure "A" of the illustrated propulsion motor variable speed drive, what statement is true?	both the bridge rectifier and the controller inverter bridge are thyristor controlled in terms of switching	both the bridge rectifier and the controller inverter bridge are transistor controlled in terms of switching	the bridge rectifier is uncontrolled and the controller inverter bridge is thyristor controlled in terms of switching	**the bridge rectifier is uncontrolled and the controller inverter bridge is transistor controlled in terms of switching**
72	A shown in figure "B" of the illustrated propulsion motor variable speed drive, what principle is used to achieve variable frequency sine-wave approximated alternating current?	power width modulation	**pulse width modulation**	phase width modulation	pulse wave modulation
73	A shown in figure "B" of the illustrated propulsion motor variable speed drive, what statement is true concerning the PWM voltage output?	**the voltage has a constant magnitude, but varies in pulse width and polarity**	the voltage has a constant magnitude and polarity, but varies in pulse width	the voltage has a constant magnitude and pulse width, but varies in polarity	the voltage has a constant pulse width and polarity, but varies in magnitude
74	A shown in the illustration, figure "C" represents what type of lighting fixture?	incandescent	high pressure mercury	**low pressure sodium**	high pressure sodium
75	A shown in the illustration, figure "D" represents what type of lighting fixture?	incandescent	high pressure mercury	low pressure sodium	**high pressure sodium**
76	A shown in the illustration, which lighting fixture represents a high pressure sodium lamp?	A	B	C	**D**
77	A shown in the illustration, which lighting fixture represents a low pressure sodium lamp?	A	B	**C**	D
78	A shown in the illustration, which of the lighting fixtures represents an incandescent bulb?	A	**B**	C	D
79	A signal derived from an amplifier output and returned to the amplifier input is called what type of signal?	monitoring signal	inverse signal	reverse signal	**feedback signal**
80	A silicon controlled rectifier (SCR) is a solid state device used for what functional purpose?	functions like an amplifier and controls relatively low load current	functions like an amplifier and controls relatively high load current	functions like a switching device and controls relatively low load current	**functions like a switching device and controls relatively high load current**
81	A single-phase capacitor-start induction motor starts, comes up to about 75% rated speed, slows down to a lower speed, and accelerates again. Where is the problem most likely to be?	starting winding	**running winding**	starting capacitor	running centrifugal switch

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82	A single-phase split-phase induction motor fails to start. The rotor is spun rapidly by hand, then the line switch is closed. Having started by this method it is noted that the motor fluctuates between a very slow speed and half speed. What motor component is faulty?	starting winding	centrifugal mechanism	centrifugal switch	**running winding**
83	A single-phase split-phase induction motor will only start if you spin the rotor rapidly with the line switch closed. After starting, its speed fluctuates between very slow and half-speed. What motor component most likely is faulty?	starting winding	centrifugal mechanism	centrifugal switch	**running winding**
84	A split-phase induction squirrel-cage motor will not start and come up to speed, even though the rated voltage, rated frequency, and rated load are applied. Which of the following troubles would be suspected?	a shorted centrifugal switch	a shorted rotor bar	a shorted thermal protector	**an open run or start winding**
85	A storage battery for an emergency lighting and power system must have the capacity to accomplish which of the following?	**close all watertight doors twice and open them once**	open all watertight doors four times and close them twice	open and close all watertight doors in six consecutive cycles within a 20 second period	open and close all watertight doors in six consecutive cycles within a 45 second period
86	A switchboard ammeter indicates a reading slightly above 'zero' when the leads are disconnected. What is this caused by?	**mechanical misalignment of the meter pointer**	a poor ground for the meter case	static electricity in the air	capacitors inside the meter storing charges
87	A testing device called a 'growler' is being used to locate a shorted coil in the stator of an AC electrical machine. When the 'feeler' is moved over a slot containing the shorted coil, what would be the result?	**a growling noise will be heard and the feeler will vibrate**	any vibration within the feeler will cease	the meter needle will be deflected to zero	the meter needle will be deflected to full-scale
88	A thermal-magnetic circuit breaker for a 300 KW alternator is rated at 500 amperes at full continuous load. Which of the following conditions will trip the breaker?	Sustained current draw of 450 amperes for 2 hours.	Sustained current draw of 500 amperes for 10 minutes.	Momentary current draw of 1000 amperes for 3 seconds.	**Instantaneous current draw of 5,000 amperes.**
89	A three-phase alternator has a load current of 300 amps, with a 0.8 power factor, and supplying 450 volts. What will be the power indicated on the kilowatt meter, located on the main switchboard?	133 kw	155 kw	**187 kw**	212 kw
90	A three-phase alternator is operating at 450 volts with the switchboard ammeter indicating 300 amps. The kW meter currently indicates 163.6 kW, with a power factor of 0.7. If the power factor increases to 0.8, how much would the kW meter reading increase by?	17.8 KW	**23.2 KW**	30.6 KW	37.8 KW

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91	A three-phase alternator is operating at 450 volts with the switchboard ammeter indicating 300 amps. The kW meter currently indicates 163.6 kW, with a power factor of 0.7. If the power factor increases to 0.8, what would the new kW meter reading?	181.4 kW	**187.0 kW**	194.2 kW	201.4 kW
92	A three-phase alternator is operating at 450 volts, delivering 250 amps at 0.6 power factor. If the power factor increases to 0.8, how much of an increase will there be in the kilowatt load?	**38.97 kW**	116.91 kW	155.88 kW	194.85 kW
93	A three-phase alternator operates at 450 volts with a 0.8 power factor. If the ammeter indicates 250 amperes, what should be the kW meter reading?	90.00 kW	127.27 kW	**155.70 kW**	194.85 kW
94	A three-phase electrical system is equipped with ground detecting lamps. If one of the lamps is dark, and remains dark when the test switch is operated, what does this indicate?	**the dark lamp must be replaced**	there is a ground in the line with the dark lamp	there are grounds in two of the three phases	the voltage to the dark lamp is less than that of the system
95	A three-phase, induction-type motor experiences an open in one phase. Which of the listed automatic protective devices will prevent the motor from being damaged?	Overspeed trip	**Thermal overload relay**	Three-pole safety switch	Magnetic blowout coil
96	A triac thyristor functions as a control device and can be thought of to function similarly as which of the following circuits?	two NPN transistors in parallel with a common base lead	a diode in series with a temperature sensitive capacitor	**a bidirectional SCR with a common gate**	a triode tube with an extra heavy grid element
97	A turbo generator has a rated output of 1200 kW at 60 Hertz, with a no load frequency of 61.5 Hertz. What is its speed droop?	1.025%	1.500%	**2.439%**	2.500%
98	A typical common digital multimeter (DMM) can be used to measure what values?	voltage, current, and reactance	current, frequency, and resistance	**voltage, current, and resistance**	current, frequency, and reactance
99	A variable shunt, connected across the series field coils of a DC compound wound generator, permits adjustment of the degree of compounding. What is this variable shunt called?	divider	**diverter**	converter	rheostat
100	A vessel is equipped with two ship's service generators. Generator #1 is rated at 900 kW and generator #2 is rated at 600 kW. During parallel operation, with a hotel load of 1,000 kw, what should be the kW load on generator #2 if the load is shared proportionately?	100 kw	**400 kw**	500 kw	600 kw
101	A voltage amplifier has a calculated voltage gain of 5. Which statement is true concerning input and output voltages?	If the input changes 5 volts, the output changes 10 volts.	If the input changes 10 volts, the output changes 5 volts.	**If the input changes 2 volts, the output changes 10 volts.**	If the input changes10 volts, the output changes 2 volts.

ID #	Question	Choice A	Choice B	Choice C	Choice D
102	A wire is being used as a replacement having twice the length and one-half the cross-sectional area of the original wire. What will be the resistance of this new wire, when compared to that of the original wire?	**four times as great**	twice as much	the same as the original resistance	one-half of the original resistance
103	Aboard ship, a grounded field coil in an AC synchronous motor can be determined by using a _____.	portable growler	galvanometer	visual inspection	**megohmmeter**
104	AC circuits can possess characteristics of resistance, inductance, and capacitance. In terms of units of measure, how is the capacitive reactance of the circuit expressed?	**ohms**	mhos	henrys	farads
105	AC circuits may develop resistance, inductance, and capacitance. What is the unit of measure used to express inductive reactance?	**ohms**	mhos	henrys	farads
106	AC generator circuits are protected against malfunctions due to prime mover power loss. Specifically what device or devices provide this protection?	main bus disconnect links	a separate battery backup	reverse current relays	**reverse power relays**
107	According to 46 CFR Part 111, each motor controller is required to have an elementary wiring schematic diagram to assist in troubleshooting. Assuming that a vessel is in complete compliance with this regulation, where would you expect to find this schematic?	**on the inside of the motor controller door**	in the engineering department office	on the outside of the motor controller door	on the inside of the motor junction box
108	According to 46 CFR, Subchapter I (Cargo and Miscellaneous Vessels), emergency lighting and power systems and the associated emergency power sources must be operated, inspected, and tested at prescribed intervals under certain conditions and that the results of these tests be properly documented. Where are the test results required to be recorded?	engineering log book	deck log book	**official log book**	oil record book
109	According to 46 CFR, Subchapter I (Cargo and Miscellaneous Vessels), it is required that internal combustion driven emergency generators be periodically tested for a specified period of time to demonstrate their ability to properly supply the required emergency load. What statement is true concerning the time interval between tests and the duration of the test?	**They shall be operated under load for two hours every month that the vessel is navigated.**	They should be operated under load for one hour every two months that the vessel is navigated.	They should be operated with no load for two hours every month that the vessel is navigated.	They should be operated with no load for one hour every two months that the vessel is navigated.

ID #	Question	Choice A	Choice B	Choice C	Choice D
110	According to 46 CFR, Subchapter I (Cargo and Miscellaneous Vessels), it is required that storage batteries to be tested for a specified period of time to demonstrate their ability to properly supply the required emergency load. What statement is true concerning the time interval between load tests?	They should be load tested at least once each week that the vessel is navigated.	**They should be load tested at least once each month that the vessel is navigated.**	They should be load tested at least once each six month period that the vessel is navigated.	They should be load tested at least once each year that the vessel is navigated.
111	According to 46 CFR, Subchapter I (Cargo and Miscellaneous Vessels), on vessels making a voyage of more than 48 hours of duration, what statement is true concerning the examination and testing of steering gear, whistle, and means of communication?	The examinations and tests are to be performed by the electrician within a period of not more than 12 hours prior to departure.	**The examinations and tests are to be performed by an officer of the vessel within a period of not more than 12 hours prior to departure.**	The examinations and tests are to be performed by an officer of the vessel within a period of not more than 1 hours prior to departure.	The examinations and tests are to be performed by an officer of the vessel within a period of not more than 24 hours prior to departure.
112	According to 46 CFR, Subchapter I (Cargo and Miscellaneous Vessels), what statement is true concerning the operation and inspection of emergency lighting and power systems?	They should be operated and inspected at least once daily anytime that the vessel is navigated.	**They should be operated and inspected at least once in each week that the vessel is navigated.**	They should be operated and inspected at least once in each month that the vessel is navigated.	They should be operated and inspected at least once in each six month period that the vessel is navigated.
113	According to 46 CFR, Subchapter J (Electrical Engineering(, Which of the following statements concerning battery installations is correct?	When power ventilation is required, the ventilation may be accomplished by a ventilation system that serves other spaces.	When power ventilation is required, blower blades must be nonsparking and the system must be interlocked with the battery charger to prevent simultaneous operation.	**When power ventilation is required, blower blades must be non-sparking and the system must be interlocked with the battery charger to prevent charger operation unless the ventilation fan is running.**	Power and lighting batteries must be of the lead-acid type only.
114	According to 46 CFR, Subchapter J (Electrical Engineering) what is, the minimum number of consecutive cranking cycles an emergency diesel generator starting system must be capable of providing?	two cycles	three cycles	**six cycles**	eight cycles
115	According to 46 CFR, Subchapter J (Electrical Engineering) which of the following motor applications would be required to be continuous in terms of duty cycle?	Anchor windlass drive motor	**Main engine lube oil pump drive motor**	Deck winch drive motor	Boat winch drive motor

ID #	Question	Choice A	Choice B	Choice C	Choice D
116	According to 46 CFR, Subchapter J (Electrical Engineering), a steering failure alarm system must give audible and visual indication of the failure of the steering gear when the actual rudder position differs from the ordered rudder angle by the follow-up control system by more than 5 degrees within a certain time period for certain changes in ordered rudder position. What is the alarm point in seconds when the ordered rudder change is 35 degrees?	more than 5 seconds	more than 6.5 seconds	**more than 17.3 seconds**	more than 30 seconds
117	According to 46 CFR, Subchapter J (Electrical Engineering), a steering failure alarm system must give audible and visual indication of the failure of the steering gear when the actual rudder position differs from the ordered rudder angle by the follow-up control system by more than 5 degrees within a certain time period for certain changes in ordered rudder position. What is the alarm point in seconds when the ordered rudder change is 5 degrees?	more than 5 seconds	**more than 6.5 seconds**	more than 30 seconds	more than 70 seconds
118	According to 46 CFR, Subchapter J (Electrical Engineering), a steering failure alarm system must give audible and visual indication of the failure of the steering gear when the actual rudder position differs from the ordered rudder angle by the follow-up control system by more than 5 degrees within a certain time period for certain changes in ordered rudder position. What is the alarm point in seconds when the ordered rudder change is 70 degrees?	**more than 5 seconds**	more than 6.5 seconds	more than 30 seconds	more than 70 seconds
119	According to 46 CFR, Subchapter J (Electrical Engineering), electric motors operating in an engine room machinery space must be designed for an ambient temperature of what value?	40°C	**50°C**	60°C	70°C
120	According to 46 CFR, Subchapter J (Electrical Engineering), emergency diesel engine starting systems are required to have sufficient capacity to provide power for at least how many consecutive starts?	3	**6**	9	12

ID #	Question	Choice A	Choice B	Choice C	Choice D
121	According to 46 CFR, Subchapter J (Electrical Engineering), emergency generators are required to have specific safety shutdowns, including prime mover overspeed. If a direct coupled emergency diesel generator's rated rpm is 1200, what is the maximum setting of the overspeed trip device allowed?	1260 rpm	1320 rpm	**1380 rpm**	1440 rpm
122	According to 46 CFR, Subchapter J (Electrical Engineering), for emergency power and lighting systems, which of the listed items is the only permissible starting aid for the emergency diesel generator engine?	Ether	Lube oil heater	**Jacket water heater**	Fuel oil heater
123	According to 46 CFR, Subchapter J (Electrical Engineering), for the purposes of the installation of a new electric motor and its controller, which of the following applications would allow low voltage release to be used?	**a controller for a motor of less than 2 HP**	a controller for a motor where automatic restart would be hazardous	a controller for a non-vital motor of 2 HP or more	a controller for a non-vital motor of 5 HP or more
124	According to 46 CFR, Subchapter J (Electrical Engineering), general emergency alarm system power supplies are required to have overcurrent protection from a fused switch or circuit breaker. If the general emergency alarm system load when connected is 15 amps, what is the minimum required fuse rating if a fused switch is used for overcurrent protection?	15 amps	18 amps	20 amps	**30 amps**
125	According to 46 CFR, Subchapter J (Electrical Engineering), in response to a loss of normal power or a simulated test, when will the emergency loads automatically be transferred to the emergency diesel generator?	as soon as it is started	when the electric potential of the ship's service generators drops 15 to 40 percent below normal value	**when the potential from the emergency generator reaches 85 to 95 percent of its normal value**	when the electric potential of the ship's service generators drops to 85 to 95 percent of the normal value
126	According to 46 CFR, Subchapter J (Electrical Engineering), in terms of conductor size, the capacity of each branch circuit providing power to a fire detection or alarm system must not be less than what percent of the maximum load?	50%	100%	**125%**	150%
127	According to 46 CFR, Subchapter J (Electrical engineering), regulations prohibit the use of portable electric cord or fixture wire aboard ship if that wire or cord is smaller than what size?	12 AWG	14 AWG	16 AWG	**18 AWG**
128	According to 46 CFR, Subchapter J (Electrical Engineering), regulations require that lighting fixture globes must be protected by guards if the fixtures are located in certain spaces. Which of the listed spaces would be an example?	**steering gear room**	galley	living quarters	wheelhouse

ID #	Question	Choice A	Choice B	Choice C	Choice D
129	According to 46 CFR, Subchapter J (Electrical Engineering), the capacity of a general emergency alarm system feeder fuse must be at least what ampere value?	Equal to the connected load current	125 percent of the connected load current	150 percent of the connected load current	**200 percent of the connected load current**
130	According to 46 CFR, Subchapter J (Electrical Engineering), the type of control circuit logic associated with auxiliaries vital to the operation of propulsion equipment, where automatic restart after a voltage failure would not create a hazard, is termed what?	low voltage protection	high amperage protection	**low voltage release**	high amperage release
131	According to 46 CFR, Subchapter J (Electrical Engineering), what is another term for a motor enclosure which is considered to be waterproof?	**watertight**	drip proof	spray tight	spray proof
132	According to 46 CFR, Subchapter J (Electrical Engineering), what is the minimum conductor size allowed for use in making up a flexible electrical cord?	10 AWG	14 AWG	**18 AWG**	20 AWG
133	According to 46 CFR, Subchapter J (Electrical Engineering), what is the required minimum capacity in terms of hours of operation required of the emergency power sources for cargo vessels certified for all waters and 1600 GT or more?	6 hours	8 hours	**18 hours**	36 hours
134	According to 46 CFR, Subchapter J (Electrical Engineering), what is the required minimum capacity in terms of hours of operation required of the emergency power sources for passenger vessels certified for ocean, Great Lakes, coastwise, and international voyage service?	6 hours	8 hours	18 hours	**36 hours**
135	According to 46 CFR, Subchapter J (Electrical Engineering), what is the required minimum capacity in terms of hours of operation required of the emergency power sources for passenger vessels certified for other than ocean, Great Lakes, coastwise, and international voyage service?	6 hours or twice the time of run, whichever is less.	8 hours or twice the time of run, whichever is less.	**18 hours**	36 hours

ID #	Question	Choice A	Choice B	Choice C	Choice D
136	According to 46 CFR, Subchapter J (Electrical Engineering), what statement is true concerning a 3 phase ungrounded electrical distribution system's ground detection system as illustrated in figure "B" of the illustration?	**The system provides continuous indication of circuit status to ground with a provision to remove the indicating device from the reference ground.**	The system does NOT provide a continuous indication of circuit status to ground but has a provision to connect the indicating device to reference ground for ground detection.	The system provides continuous indication of circuit status to ground with an added provision to connect the indicating device to the reference ground for ground detection.	The system does NOT provide a continuous indication of circuit status to ground but has a provision to remove the indicating device to reference ground.
137	According to 46 CFR, Subchapter J (Electrical Engineering), what statement is true concerning the use of twist-on connectors?	Twist-on connectors may be used for making joints in cables.	Twist-on connectors may be used to facilitate a conductor splice.	Twist-on connectors may be used to extend the length of a circuit.	**Twist-on connectors may be used in enclosures as long as the insulating cap can be secured to prevent loosening due to vibration.**
138	According to 46 CFR, Subchapter J (Electrical Engineering), what type of vessel is required to have a temporary emergency power source AND a final emergency power source?	**Passenger vessels certified for ocean, Great Lakes, coastwise and international voyage service.**	Passenger vessels certified for other than ocean, Great Lakes, coastwise and international voyage service.	Tank ships certified for all waters and 1600 GT or more.	Oceanographic vessels certified for international voyage service and 500 GT or more
139	According to 46 CFR, Subchapter J (Electrical Engineering), what type of vessel is required to have emergency lighting provided by automatically connected or manually controlled battery; automatically or manually started generator; or relay-controlled battery-operated lanterns?	Passenger vessels certified for ocean, Great Lakes, coastwise, and international voyage service?	Passenger vessels certified for other than ocean, Great Lakes, coastwise, and international voyage service?	Miscellaneous self-propelled vessels certified for ocean, Great Lakes, and coastwise service and 500 GT or more.	**Cargo vessels certified for ocean, Great Lakes, and coastwise service and less than 500 GT.**
140	According to 46 CFR, Subchapter J (Electrical Engineering), when considering replacement, instrument and control wiring in a switchboard is to be of what minimum size?	12 AWG	**14 AWG**	16 AWG	18 AWG
141	According to 46 CFR, Subchapter J (Electrical Engineering), when supplying emergency lighting loads, the storage battery initial voltage must not exceed the standard system voltage by more than what percentage?	2%	3%	**5%**	10%
142	According to 46 CFR, Subchapter J (Electrical Engineering), which of the following IEEE publications would be the best reference for general guidance on recommended practice for electrical installations aboard ship?	IEEE C37.13	**IEEE 45**	IEEE 100	IEEE 1580

ID #	Question	Choice A	Choice B	Choice C	Choice D
143	According to 46 CFR, Subchapter J (Electrical Engineering), which of the following starting aids is the ONLY method allowed to ease the starting of emergency diesel generator engines?	Ether injection systems	Electric, steam, or hot water heated lube oil heaters	**Thermostatically controlled electric jacket water heaters**	Electric air intake heaters
144	According to 46 CFR, Subchapter J (Electrical Engineering), which of the listed protection or release control logic schemes would require a motor controller to be manually re-started upon restoration of voltage following a power failure?	Overload protection	Low voltage release	**Low voltage protection**	Reverse current protection
145	According to 46 CFR, Subchapter J (Electrical Engineering), which of the spaces listed is defined as a 'location requiring an exceptional degree of protection' when considering the installation of shipboard electrical equipment?	**Machinery space**	Chart room	Radio or gyro room	Accommodation space
146	According to 46 CFR, Subchapter J (Electrical Engineering), which statement is true concerning a circuit breaker located in the machinery space and installed in a 440V AC distribution system?	It can be dependent upon mechanical cooling to operate within its rating.	It can have a long-time delay trip element set above the continuous current rating of the trip element or the circuit breaker frame.	**It must have an interrupting rating sufficient to interrupt the maximum asymmetrical short-circuit current available at the point of application.**	It must have an ambient temperature rating of 40 degrees C.
147	According to 46 CFR, Subchapter J (Electrical Engineering), with respect to acceptable voltage variations for electrical equipment which statement is true if the equipment rated voltage is 450 VAC?	**Actual applied voltage should be between 405 and 477 VAC.**	Actual applied voltage should be between 423 and 495 VAC.	Actual applied voltage should be between 423 and 477 VAC.	Actual applied voltage should be between 405 and 495 VAC.
148	According to 46 CFR, Subchapter J (Electrical Engineering). who must be notified before alterations or modifications can be performed to electrical installations that deviate from approved plans or that may effect the safety of the vessel?	The company's port engineer	The vessel's master	The vessel's chief engineer	**The Officer in Charge of Marine Inspection**
149	According to CFR 111.75-5, what would be the maximum amperage load on circuit #2 (2L110) of the illustrated lighting panel board L110 of the illustration?	3 amps	**12 amps**	15 amps	16 amps
150	According to CFR, Subchapter J (Electrical Engineering), which of the following statements is true concerning flexible electric cord and cable used aboard ship?	No. 12 AWG cable or cord may be spliced for repairs if made in compliance with CFR 111.60-19.	No. 14 AWG cable or cord may be spliced for repairs if made in compliance with CFR 111.60-19.	No. 16 AWG cable or cord may be spliced for repairs if made in compliance with CFR 111.60-19.	**No. 18 AWG cable or cord may be spliced for repairs if made in compliance with CFR 111.60-19.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
151	According to its nameplate, a power transformer has Class F insulation and is rated for 40 degrees C ambient temperature. According to 46 CFR, Subchapter J (Electrical Engineering) what would be the maximum winding temperature allowable as taken by the resistance method?	115 degrees C	150 degrees C	**155 degrees C**	190 degrees C
152	According to the 46 CFR, Subchapter J (Electrical Engineering) requires which of the listed features to open the power circuit to a motor due to low voltage and re-close automatically when the voltage is restored to normal?	Low voltage protection	6 volt non-renewable link fuse	12 volt renewable link fuse	**Low voltage release**
153	According to the 46 CFR, Subchapter J (Electrical Engineering), for motor controller replacement purposes, which motor application would require low voltage release?	a motor controller for a vital propulsion auxiliary with restart capability at a central control station	**a motor controller for a vital propulsion auxiliary without restart capability at a central control station and where automatic restart would not be hazardous**	a motor controller for a vital propulsion auxiliary where automatic restart would be hazardous	a motor controller for a non-vital auxiliary
154	According to the sample sheet of a typical "List of Motors and Controls" as shown in the illustration, which of the following motor applications features a means of keeping the motor windings warm and dry when the motor is idle?	Main engine piston cooling water pump	Main engine sea water cooling pump	Main fuel oil transfer pump	**Amidship mooring winch**
155	According to the sample sheet of a typical "List of Motors and Controls" as shown in the illustration, which of the following motor applications features a motor enclosure designed for dusty, wet, and hazardous locations?	Main engine piston cooling water pump	Main engine sea water cooling pump	Main fuel oil transfer pump	**Amidship mooring winch**
156	After closing the circuit breaker to place two alternators with identical ratings in parallel, in terms of achieving a balance between the two alternators, what is the NEXT step?	balance the power factor	balance the voltage	**balance the kilowatt load**	balance the ampere load
157	After draining the oil and flushing out the electric motor bearing as shown in figure "A" of the illustration, when adding clean oil, after reinstalling the drain plug, to what level should the oil be brought up to for optimal performance?	To the bottom of item #1.	To the top of item #1.	To the top of the motor shaft.	**To the midpoint of item #3.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
158	After pushing the test pushbutton of the illustrated high voltage ground detection system, the ground lamps indicate as shown in example #1 where lamps B and C are brighter than normal and lamp A is darker than normal. What does this indicate?	**A ground on phase A of the bus.**	A ground on phase B of the bus.	A ground on phase C of the bus.	Grounds on phases B and C of the bus.
159	After pushing the test pushbutton of the illustrated high voltage ground detection system, the ground lamps indicate as shown in example #2 where lamps A and C are brighter than normal and lamp B is darker than normal. What does this indicate?	A ground on phase A of the bus.	**A ground on phase B of the bus.**	A ground on phase C of the bus.	Grounds on phases A and C of the bus.
160	After pushing the test pushbutton of the illustrated high voltage ground detection system, the ground lamps indicate as shown in example #3 where lamps A and B are brighter than normal and lamp C is darker than normal. What does this indicate?	A ground on phase A of the bus.	A ground on phase B of the bus.	**A ground on phase C of the bus.**	Grounds on both phases A and B of the bus.
161	After the refrigerant has been recovered, leaks repaired if necessary, the system ideally should undergo a dehydration evacuation prior to recharging with refrigerant. As shown in the illustration, besides the vacuum pump suction manifold isolation valve being opened, what would be the proper valve positions to accomplish and prove the evacuation?	Valves 1, 2, and 3 should be front-seated and both gauge manifold hand valves should be closed.	Valves 1, 2, and 3 should be back-seated and both gauge manifold hand valves should be open.	Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be open, and the high-side gauge manifold hand valve should be closed.	**Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be closed, and the high-side gauge manifold hand valve should be open.**
162	All electric cables passing through watertight bulkheads must be configured in what manner?	**installed with watertight stuffing tubes**	grounded on both sides of the bulkhead	fitted with unions on each side of the bulkhead	welded on both sides of the bulkhead
163	All of the schematic diagrams shown in the illustration represent which of the listed solid-state circuits?	**Full-wave rectifier**	Half-wave rectifier	Flip-flop generator	Full-wave rectifier bridge
164	Alternating current circuits may develop resistance, inductance and capacitance. What would be the unit of measure used in measuring the inductance of a wound coil?	ohms	mhos	**henrys**	farads
165	Alternating current circuits may develop resistance, inductance, and capacitance. What is the unit of measure for expressing capacitance?	ohms	mhos	henrys	**farads**
166	Although saturable reactors are extremely useful in some applications, why is their gain low?	**core hysteresis losses**	inductive reactance in the control winding	IR drop throughout the load winding	eddy current losses

ID #	Question	Choice A	Choice B	Choice C	Choice D
167	Ammeters and voltmeters used in sinusoidal AC power systems indicate which of the following values of the waveforms measured?	Peak value	**Root-mean-square value**	Average value	Maximum value
168	An AC circuit has a capacitive reactance of 30 ohms in addition to an inductive reactance of 40 ohms connected in series. What is the total reactance of the circuit?	8.37 ohms	**10.00 ohms**	50.00 ohms	70.00 ohms
169	An AC diesel-electric propulsion system requires less maintenance than a DC diesel-electric system. Which system component requires less maintenance?	Diesel engine	**Propulsion motor**	AC generator	Propulsion transformers
170	An AC generator operating in parallel loses its excitation without tripping the circuit breaker. What will be the result?	It will not affect the faulty generator due to the compensation of the other generators.	It will cause the slip rings to melt.	It will increase the output amperage between the armature and the bus.	**It will cause high currents to be induced in the field and stator windings.**
171	An AC generator produces 60 Hz at 1800 RPM. If the generator speed is increased to 1830 RPM, what will happen to the frequency in Hz?	decrease to 59 Hz	remain at 60 Hz	**increase to 61 Hz**	increase to 63 Hz
172	An AC motor is started and produces 25 horsepower when running at rated speed and load. Neglecting power factor considerations, how much will the kW meter reading increase for the sole generator providing power?	**18.65 kW**	25.65 kW	30.65 kW	37.65 kW
173	An accidental ground in a motor can be defined as an electrical connection between the wiring of the motor and what other aspect of the motor installation?	supply fuses	circuit breaker	**metal framework**	contactor
174	An accidental path of low resistance bypassing the intended path and allowing passage of an abnormally high amount of current is known as what?	open circuit	**short circuit**	polarized ground	ground reference point
175	An accidental path of low resistance which bypasses the intended resistance and passes an abnormal amount of current is known as what?	polarized ground	**short circuit**	ground reference point	open circuit
176	An across-the-line starter is typically used for which of the following applications?	Reduced-current starting of large motors	Low torque starting of small motors	Low resistance starting of DC motors	**Full-voltage starting of motors**

ID #	Question	Choice A	Choice B	Choice C	Choice D
177	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 100 °F, what statement is true concerning the operating discharge pressure if it is currently 120 psig?	The discharge pressure is within the normal expected range for this ambient temperature.	**The discharge pressure is lower than it should be for this ambient temperature.**	The discharge pressure is higher than it should be for this ambient temperature.	Not enough information is given to determine whether the discharge pressure is low, normal, or high for this ambient temperature.
178	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 80 °F, what statement is true concerning the operating compressor motor current draw if it is currently 10.5 amps?	**The suction pressure is within the normal expected range for this ambient temperature.**	The suction pressure is lower than it should be for this ambient temperature.	The suction pressure is higher than it should be for this ambient temperature.	Not enough information is given to determine whether the suction pressure is low, normal, or high for this ambient temperature.
179	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 80 °F, what statement is true concerning the operating suction pressure if it is currently 4 psig?	The suction pressure is within the normal expected range for this ambient temperature.	The suction pressure is lower than it should be for this ambient temperature.	**The suction pressure is higher than it should be for this ambient temperature.**	Not enough information is given to determine whether the suction pressure is low, normal, or high for this ambient temperature.
180	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, what would be the normal range of expected discharge pressures if the ambient air temperature is 90 °F?	**150-190 psig**	160-180 psig	190-230 psig	200-220 psig

ID #	Question	Choice A	Choice B	Choice C	Choice D
181	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of 32 °F, but it is currently operating with a stable supply air temperature of 35 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 80 °F, what statement is true concerning the operating discharge pressure if it is currently 140 psig?	The discharge pressure is within the normal expected range for this ambient temperature.	**The discharge pressure is lower than it should be for this ambient temperature.**	The discharge pressure is higher than it should be for this ambient temperature.	Not enough information is given to determine whether the discharge pressure is low, normal, or high for this ambient temperature.
182	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of 32 °F, but it is currently operating with a stable supply air temperature of 35 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 80 °F, what statement is true concerning the operating discharge pressure if it is currently 220 psig?	The discharge pressure is within the normal expected range for this ambient temperature.	The discharge pressure is lower than it should be for this ambient temperature.	**The discharge pressure is higher than it should be for this ambient temperature.**	Not enough information is given to determine whether the discharge pressure is low, normal, or high for this ambient temperature.
183	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of 32 °F, but it is currently operating with a stable supply air temperature of 35 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, if the ambient air temperature is 80 °F, what statement is true concerning the operating suction pressure if it is currently 2 psig?	The suction pressure is within the normal expected range for this ambient temperature.	**The suction pressure is lower than it should be for this ambient temperature.**	The suction pressure is higher than it should be for this ambient temperature.	Not enough information is given to determine whether the suction pressure is low, normal, or high for this ambient temperature.
184	An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature setpoint of 32 °F, but it is currently operating with a stable supply air temperature of 35 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, what would be the normal range of expected discharge pressures if the ambient air temperature is 90 °F?	150-190 psig	160-180 psig	**190-230 psig**	200-220 psig

ID #	Question	Choice A	Choice B	Choice C	Choice D
185	An alternator is being paralleled with one already on the line. At the INSTANT the incoming generator circuit breaker is closed, what will happen to the frequency of the incoming alternator?	increase	not change	**decrease**	be exactly 60 hertz
186	An alternator switchboard has a synchroscope and synchronizing lamps. If the synchroscope is broken, which of the steps listed is the most essential before an alternator can be paralleled with the bus?	The breaker should be closed when one synchronizing lamp is dark and the other is bright.	The breaker should be closed when both synchronizing lamps are bright.	**The frequency meter should be used to determine that the incoming alternator frequency is slightly higher than the bus, then the breaker should be closed when both synchronizing lamps are dark..**	A portable phase sequence indicator must be used to verify the information from the lamps.
187	An autotransformer is equipped with a 50% tap, a 65% tap, and an 80% tap. Which of the following statements is true concerning a load connected to the 50% tap?	**The load is receiving one half of line voltage and drawing one half of line current.**	The load is receiving one half of line voltage and drawing two times line current.	The load is receiving two times line voltage and drawing one half of line current.	The load is receiving two times line voltage and drawing two times line current.
188	An electric heating element supplied with 120 volts draws 15 amps. How much power will be consumed?	15 watts	45.57 watts	8 watts	**1800 watts**
189	An electric propulsion drive system in which the propulsion generator only supplies power to the propulsion motor is referred to as what type of system?	an integrated system	**a dedicated system**	a composite system	a multi-purpose system
190	An electric propulsion drive system in which the propulsion generator supplies power to both the propulsion motor and ship service loads is referred to as what type of system?	**an integrated system**	a dedicated system	a composite system	a multi-purpose system
191	An electrical component is connected across a 120 volt 60 hertz AC supply. What is the current drawn by the component if the impedance is 200 ohms?	0.01 amperes	**0.60 amperes**	1.67 amperes	100 amperes
192	An electrical connection between the wiring of an electric motor and its metal frame is known as what?	eddy current	**ground**	impedance	flux leakage
193	An electro-magnetic relay is most commonly used for what purpose?	provide inductive power to a circuit	**remotely open and close contacts by action of a coil**	provide transformer secondary winding overcurrent protection	provide capacitance to a circuit

ID #	Question	Choice A	Choice B	Choice C	Choice D
194	An increase in which of the listed conditions will increase the speed of a synchronous electric motor?	**Frequency**	Voltage	Armature current	Inductance
195	An insulation resistance reading is taken at 20°C and found to be 10 megohms. What would you expect the resistance reading to be at 40°C?	**2.5 megohms**	10 megohms	15 megohms	20 megohms
196	An insulation resistance test is performed on a particular piece of electric equipment. In addition to the resistance reading and date of test, what information listed below should be entered in the electrical log?	The maximum allowable operating temperature of the machine.	**The temperature of the machine at the time the resistance reading was taken.**	The normal temperature rise of the machine.	The complete nameplate data from the resistance test instrument used to obtain the reading.
197	An internal resistance is placed in series with the meter movement of which of the following instruments?	AC ammeter	DC ammeter	**DC voltmeter**	AC frequency meter
198	An ohmmeter used to test for front-to-back resistance of a PN junction diode should produce roughly what ratio?	**100:1**	500:1	1000:1	5000:1
199	An open in the armature of a DC motor is suspected, but is not found by visual inspection of the commutator. What would be the next step in troubleshooting this problem?	**conduct a bar to bar test of the armature**	visually inspect the armature windings	conduct an insulation resistance test of the armature	test the commutator for a ground
200	An open occurring within the field rheostat of an AC generator can be detected by short circuiting its terminals and making specific observations. What should be checked for?	negative deflection of the wattmeter pointer	positive deflection of the wattmeter pointer	**buildup of alternator voltage**	low, but constant alternator voltage
201	An open primary coil in a simple potential transformer will be indicated by which of the listed conditions?	**No voltage on the output of the secondary coil.**	An infinite resistance value on the secondary coil.	Low resistance value on the primary coil.	Overloaded secondary coil.
202	An voltage amplifier has a calculated voltage gain of 10. Which statement correctly states the gain?	**If the input changes 1 volt, the output changes 10 volts.**	If the input changes 5 volts, the output changes 1/2 volt.	If the input changes 5 volts, the output changes 15 volts.	If the input changes 10 volts, the output changes 25 volts.
203	As a DC armature revolves within a stationary magnetic field, the reversals of magnetization of the armature core lags the current reversals which produces heat. What is the correct name for this action which is minimized by the use of soft silicon steel?	copper loss	eddy-current loss	**hysteresis loss**	capacitive reaction
204	As a general rule, what is the first troubleshooting action to be taken in checking inoperative electric circuits?	draw a one line diagram of the circuitry	**test all fuses and measure the line voltage**	take megger readings	insulate the apparatus from ground

ID #	Question	Choice A	Choice B	Choice C	Choice D
205	As a matter of convenience, the illustrated test in figure "A" is being performed to determine whether or not the motor windings are grounded. In order for this megger test to be effective in detecting a ground, what condition must be met prior to conducting the test?	the disconnect switch must be closed and power available to the starter	the motor starter enclosure equipment ground bonding cable should be disconnected	**the motor starter enclosure, the motor feeder cable armor, and the motor frame must have a path of continuity and be bonded to the hull**	the motor frame equipment bonding cable must be disconnected
206	As a property of an electric circuit, how is inductance correctly described?	opposes any change in the applied voltage	**opposes any change in the current flow through the circuit**	aids any changes in the applied voltage	aids any changes in the current through the circuit
207	As a result of a serious mechanical malfunction in one of the ship's service generators operating in parallel, you must secure that generator. In order to prevent a possible overload to the remaining generator, which of the following sequential courses of action should be taken?	Trip the malfunctioning generator's circuit breaker and prime mover throttle trip.	**Trip all nonvital distribution feeder circuit breakers, remove the remaining load on the malfunctioning generator and trip its circuit breaker and then the prime mover throttle trip.**	Trip the malfunctioning generator's circuit breaker and distribution feeder circuit breakers.	Trip all nonvital distribution feeder circuit breakers, the malfunctioning prime mover turbine throttle trip, and the generator circuit breaker.
208	As load is added to a DC shunt motor, how will the motor respond?	speed up	maintain the same speed	**slow down slightly**	stop
209	As load is added to an AC generator provided with constant field excitation, the prime mover slows down. What immediate effect will this have on frequency and voltage?	**lowering frequency and lowering generated voltage**	increasing frequency and increasing generated voltage	increasing frequency and lowering generated voltage	lowering frequency and increasing generated voltage
210	As part of a routine maintenance program for deck machinery motor controllers, what should be done?	**inspect electrical wiring for evidence of corrosion or discoloration at connections**	remove covers exposed to the weather and drain water each week	remove motor covers and ventilate as weather permits	Check drum switch contact pressure every three months
211	As required by 46 CFR, Subchapter J (Electrical Engineering), the illustrated ground detection system shown in figure "B" is appropriate for which type of electrical distribution system?	ungrounded single phase AC system	dual voltage DC system	**ungrounded 3 phase AC system**	high impedance grounded neutral 3 phase AC system
212	As shown in "A" of the illustration, what type of computer network topography is represented?	bus network	single highway network	ring network	**star network**
213	As shown in "B" of the illustration, what type of computer network topography is represented?	bus network	single highway network	**ring network**	star network
214	As shown in all four diagrams illustrated, what type of logic circuit is represented?	**OR logic gate**	AND logic gate	NOR logic gate	NAND logic gate
215	As shown in all four diagrams illustrated, what type of logic circuit is represented?	OR logic gate	**AND logic gate**	NOR logic gate	NAND logic gate

ID #	Question	Choice A	Choice B	Choice C	Choice D
216	As shown in figure "1" of the illustration, a correctly connected synchronous transmission causes the receiver to be in correspondence with the transmitter. If the receiver is out of correspondence, 120 degrees out of zero, but the torque direction is correct as shown in figure "2", what figure shows the incorrect connections responsible for this condition?	A	B	**C**	D
217	As shown in figure "1" of the illustration, a correctly connected synchronous transmission causes the receiver to be in correspondence with the transmitter. If the receiver is out of correspondence, 180 degrees out of zero, but the torque direction is correct as shown in figure "2", what figure shows the incorrect connections responsible for this condition?	A	**B**	C	D
218	As shown in figure "1" of the illustration, a correctly connected synchronous transmission causes the receiver to be in correspondence with the transmitter. If the receiver is out of correspondence, 240 degrees out of zero, but the torque direction is correct as shown in figure "2", what figure shows the incorrect connections responsible for this condition?	A	B	C	**D**
219	As shown in figure "1" of the illustration, a correctly connected synchronous transmission causes the receiver to be in correspondence with the transmitter. If the receiver is out of correspondence, properly zeroed, but the torque direction is reversed as shown in figure "2", what figure shows the incorrect connections responsible for this condition?	**A**	B	C	D
220	As shown in figure "1" of the illustration, which statement is true?	**The circuit is an AND logic gate using diode logic.**	The circuit is an OR logic gate using diode logic.	The circuit is for an AND gate using resistor transistor logic.	The circuit is for an OR gate using resistor transistor logic.
221	As shown in figure "2" of the illustration, which statement is true?	The circuit is for an OR gate using diode logic.	The circuit is for an NOR gate using diode logic.	The circuit is for an OR gate using transistor logic.	**The circuit is for an NOR gate using transistor logic.**
222	As shown in figure "3" of the illustration, which statement is true?	The circuit is for a NAND gate using diode logic.	The circuit is for an NOR gate using diode logic.	**The circuit is for an NAND gate using diode transistor logic.**	The circuit is for an NOR gate using diode transistor logic.

ID #	Question	Choice A	Choice B	Choice C	Choice D
223	As shown in figure "6" of the illustration, what does the symbol represent as used in electrical drawings?	limit switch with one set of normally open contacts	maintaining type push button with an electrical interlock	**maintaining type push button with a mechanical interlock**	normally closed contact held open mechanically by an interlock
224	As shown in figure "A" and "B" of the illustration, the potable water pump is short cycling by the action of the pressure switch as a result of an unusually high level in the potable water hydropneumatic header tank. What is most likely the cause?	The pressure switch range adjustment is set too low and must be set higher.	The pressure switch differential setting is set excessively high and the differential must be decreased.	**The potable water hydro-pneumatic header tank is in need of recharging with compressed air due to absorption of air into the water over time.**	The potable water hydro-pneumatic header tank has too much compressed air and some must be bled off.
225	As shown in figure "A" of the block diagram illustrated and where the central operating system is configured for advisory control, what does the block "MAN" represent?	It represents the control console used for vessel maneuvering purposes.	**It represents the interface by which variation in operating parameters is achieved.**	It represents the manual control of an individual control process and is considered a manual backup.	It represents the control console used for local control of engine speed.
226	As shown in figure "A" of the illustrated automatic secondary resistance motor controller, at how many operating speeds does the motor run from start-up to rated speed?	1	2	**3**	4
227	As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the input system block "ANALOG A/D" represent?	It receives digital outputs from the binary device sensors and converts these to analog signals for CPU processing.	**It receives analog outputs from the sensors and converts these to digital signals for CPU processing.**	It receives digital outputs from the binary device sensors and conditions these as digital signals for CPU processing.	It receives analog outputs from the sensors and conditions these as analog signals for CPU processing.
228	As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the input system block "DIGITAL CONTACT" represent?	It receives digital outputs from binary device sensors and converts these to analog signals for CPU processing.	It receives analog outputs from the sensors and converts these to digital signals for CPU processing.	**It receives digital outputs from binary device sensors and conditions these as digital signals for CPU processing.**	It receives analog outputs from the sensors and conditions these as analog signals for CPU processing.
229	As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the output system block "ANALOG D/A" represent?	**It receives digital outputs from the CPU and converts these to analog signals for transmission to analog actuators.**	It receives analog outputs from the CPU and converts these to digital signals for transmission to digital actuators.	It receives digital outputs from the CPU and conditions these as digital signals for transmission to digital actuators.	It receives analog outputs from the CPU and conditions these as analog signals for transmission to analog actuators.

ID #	Question	Choice A	Choice B	Choice C	Choice D
230	As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the output system block "DIGITAL OUTPUT" represent?	It receives digital outputs from the CPU and converts these to analog signals for transmission to analog actuators.	It receives analog outputs from the CPU and converts these to digital signals for transmission to digital actuators.	**It receives digital outputs from the CPU and conditions these as digital signals for transmission to digital actuators.**	It receives analog outputs from the CPU and conditions these as analog signals for transmission to analog actuators.
231	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the letters "OL" being illuminated (item "14")?	**the input measurement is beyond the range for the parameter the meter is presently set up for**	the internal fuse has blown due to an overload condition	the internal fuse is dangerously close to blowing due to an overload condition	the meter is sensing an external circuit overload condition
232	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "1" being illuminated?	The meter test leads are placed in the wrong terminal jacks for the test being performed	the meter is subjected to a potentially unsafe voltage	the meter is in range of a wireless signal	**the selector switch is selected for continuity/diode test and the secondary function pushbutton is toggled for continuity**
233	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "2" being illuminated?	the selector switch is in the resistance position and the meter leads are connected across a diode	**the selector switch is in the continuity/diode test position and the secondary function pushbutton is toggled for diode**	the selector switch is in the resistance position and the meter leads are connected across a PN junction of a transistor	the selector switch is in the continuity/diode test position and the secondary function pushbutton is toggled for continuity
234	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "3" being illuminated?	when measuring AC voltages or currents, this illuminates only during positive half cycles	when measuring AC voltages or currents, this illuminates only during negative half cycles	**when measuring DC voltages or currents, this indicates a negative polarity**	when measuring DC voltages or currents, this indicates a positive polarity
235	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "4" being illuminated?	the meter is in the presence of a high voltage electromagnetic field	the meter is in the presence of a high voltage electrostatic fields	an internal meter fuse has blown	**the meter leads are connected across a potentially unsafe voltage**
236	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "9" being illuminated?	the meter is connected with a negative polarity across a battery	the meter is connected with a positive polarity across a battery	**the meter's internal battery needs to be replaced**	the meter is selected to measure an AC voltage but is connected across a DC source

ID #	Question	Choice A	Choice B	Choice C	Choice D
237	As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the word "LEAd being illuminated (item "15")?	**It indicates a warning anytime the selector switch is moved to or from the "milliamp" or "amp" positions for the technician to change the test lead terminal jacks used.**	It indicates a warning anytime the selector switch is moved to or from the "AC volt" or "DC volt" positions for the technician to change the test lead terminal jacks used.	It indicates a warning anytime the red lead is plugged into the common terminal jack.	It indicates a warning anytime the leads develop a higher than normal resistance.
238	As shown in figure "A" of the illustrated ground fault occurring in a solidly grounded distribution system, what statement is true concerning the operation of the ground fault relay?	**The ground fault relay contacts are normally open and close only when the motor individual line currents are unbalanced due to the ground fault.**	The ground fault relay contacts are normally closed and open only when the motor individual line currents are unbalanced due to the ground fault.	The ground fault relay contacts are normally open and close only when the overall motor line current is high due to the ground fault.	The ground fault relay contacts are normally closed and open only when the overall motor line current is high due to the ground fault.
239	As shown in figure "A" of the illustrated PLC output unit, what switching technology is used to control the output load either being energized or de-energized as appropriate?	**a phototransistor controlled electro-magnetic relay**	a photodiode controlled electro-magnetic relay	a phototransistor controlled triac	a phototransistor controlled transistor (Darlington pair)
240	As shown in figure "A" of the illustrated PLC sub-circuit, what type of circuit is depicted?	AC input unit	AC output unit	**DC input unit**	DC output unit
241	As shown in figure "A" of the illustrated proportional analog controller circuit, what is the primary purpose of operational amplifier "U2"?	add the error signal voltage to the bias potentiometer output voltage to produce a summing signal voltage	subtract the error signal voltage from the bias potentiometer output voltage to produce an error signal voltage	**amplify the error signal voltage by producing a gain**	invert the error signal voltage
242	As shown in figure "A" of the illustrated proportional analog controller circuit, what is the primary purpose of operational amplifier "U3"?	add the proportional gain amplifier output voltage to the valve input voltage to produce a summing signal voltage	amplify and invert the proportional gain amplifier output voltage signal voltage	amplify the proportional gain amplifier output voltage by producing a gain	**invert the proportional gain amplifier output voltage with unity gain**
243	As shown in figure "A" of the illustrated self-contained recovery unit connection diagrams, what is the recovery method supported by the connection scheme?	direct liquid recovery	direct vapor recovery	**liquid recovery/push-pull**	vapor recovery/push-pull
244	As shown in figure "A" of the illustrated three phase alternator showing the stator winding connections, what can be said about the output line current?	line current is the phase current divided by 1.73	line current is 1.73 times the phase current	there is no relationship between line current and phase current	**line current is equal to phase current**

ID #	Question	Choice A	Choice B	Choice C	Choice D
245	As shown in figure "A" of the illustrated three phase alternator showing the stator winding connections, what can be said about the output line voltage?	**line voltage is 1.73 times the phase voltage**	line voltage is equal to the phase voltage	line voltage is phase voltage divided by 1.73	there is no relationship between line voltage and phase voltage
246	As shown in figure "A" of the illustrated ungrounded distribution system with possible ground faults, under what conditions would an outage likely occur due to a ground fault causing a circuit breaker to trip?	a single ground fault associated with any phase	two ground faults associated with the same phase	**two ground faults associated with different phases**	ground faults do not result in outages regardless of the number and location of faults
247	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 10 ohms, and R2 is 10 ohms what is the current flowing through R1 when the switch is closed?	**0.6 amp**	0.833 amp	1.2 amps	2.4 amps
248	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 10 ohms, and R2 is 10 ohms what is the current flowing through R2 with the switch closed?	**0.6 amp**	0.833 amp	1.2 amps	2.4 amps
249	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 10 ohms, and R2 is 10 ohms what is the power consumed by R1 when the switch is closed?	**3.6 watts**	7.2 watts	36 watts	72 watts
250	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 10 ohms, and R2 is 10 ohms what is the total current in the circuit when the switch is closed?	**0.6 amp**	0.833 amp	1.2 amps	2.4 amps
251	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 10 ohms, and R2 is 10 ohms what is the total power consumed by the circuit when the switch is closed?	3.6 watts	**7.2 watts**	36 watts	72 watts
252	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 110 ohms, and R2 is 10 k ohms what is the total power consumed by the circuit when the switch is closed?	1.13 milliwatts	3.6 watts	**14.24 milliwatts**	7.2 watts
253	As shown in figure "A" of the illustration if the applied voltage is 12 VDC, the resistance of R1 is 24 k ohms, and R2 is 3610 ohms what is the current flowing through R1 when the switch is closed?	.005 amps	**.434 milliamps**	2.4 milliamps	6.0 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
254	As shown in figure "A" of the illustration, assuming that the external manual "trimmer" is not fitted, what is the operational status of the comparator in terms of inputs and outputs?	The comparator receives two inputs (one from the voltage sensor and the other from the amplifier) and delivers one output (to the set point voltage potentiometer).	**The comparator receives two inputs (one from the voltage sensor and the other from the set point voltage potentiometer) and delivers one output (to the amplifier).**	The comparator receives one input (from the voltage sensor) and delivers two outputs (one to the amplifier and the other to the set point voltage potentiometer).	The comparator receives one input (from the setpoint voltage potentiometer) and delivers two outputs (one to the amplifier and the other to the voltage sensor).
255	As shown in figure "A" of the illustration, by what means is the DC motor speed controlled?	**by varying the applied armature voltage and maintaining a constant applied field voltage**	by varying the applied armature voltage and varying the applied field voltage	by maintaining a constant applied armature voltage and varying the applied field voltage	by maintaining a constant applied armature voltage and maintaining a constant applied field voltage
256	As shown in figure "A" of the illustration, concerning the signal conditioning circuit for programmable logic controller as illustrated, which statement is true?	**If the sensor input voltage signal delivered to the inverting input is less positive than the reference input signal voltage signal delivered to the non-inverting input, the amplifier output voltage will be positive.**	If the sensor input voltage signal delivered to the inverting input is less positive than the reference input signal voltage signal delivered to the non-inverting input, the amplifier output voltage will be negative.	If the sensor input voltage signal delivered to the non-inverting input is less positive than the reference input signal voltage signal delivered to the inverting input, the amplifier output voltage will be positive.	If the sensor input voltage signal delivered to the non-inverting input is less positive than the reference input signal voltage signal delivered to the inverting input, the amplifier output voltage will be negative.
257	As shown in figure "A" of the illustration, concerning the signal conditioning circuit for programmable logic controller as illustrated, which statement is true?	If the sensor input voltage signal delivered to the inverting input is more positive than the reference input signal voltage signal delivered to the non-inverting input, the amplifier output voltage will be positive.	**If the sensor input voltage signal delivered to the inverting input is more positive than the reference input signal voltage signal delivered to the non-inverting input, the amplifier output voltage will be negative.**	If the sensor input voltage signal delivered to the non-inverting input is more positive than the reference input signal voltage signal delivered to the inverting input, the amplifier output voltage will be positive.	If the sensor input voltage signal delivered to the non-inverting input is more positive than the reference input signal voltage signal delivered to the inverting input, the amplifier output voltage will be negative.
258	As shown in figure "A" of the illustration, feedback or rudder angle repeatback is used by the port or starboard amplifier in which operational modes?	**Gyro-compass and hand steering only**	Hand steering and non-followup only	Non-follow-up and gyro-compass only	Gyro-compass and synchronizing only

ID #	Question	Choice A	Choice B	Choice C	Choice D
259	As shown in figure "A" of the illustration, fine adjustments such as "rate of turn signal" have no effect on steering stand operation when the 'operation selector switch' is in what position?	GYRO	HAND	**NFU**	DIFF
260	As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "1" to "X2" reads 115 VAC; "2" to "X2" reads 115 VAC; "3" to "X2" reads 115 VAC; and "4" to "X2" reads 115 VAC	the start button is open-circuited	**the overload relay contacts are open**	the fuse is blown	the main contactor coil is open-circuited
261	As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "1" to "X2" reads 115 VAC; "2" to "X2" reads 115 VAC; "3" to "X2" reads 115 VAC; and "X1" to "4" reads 115 VAC	the start button is open-circuited	the overload relay contacts are open	the fuse is blown	**the main contactor coil is open-circuited**
262	As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "X1" to "X2" reads 115 VAC; "1" to "X2" reads 0 VAC; "2" to "X2" reads 0 VAC; and "3" to "X2" reads 0 VAC	the start button is open-circuited	the secondary winding of the control transformer is open-circuited	**the fuse is blown**	the stop button is open-circuited
263	As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "X1" to "X2" reads 115 VAC; "1" to "X2" reads 115 VAC; "2" to "X2" reads 0 VAC; and "3" to "X2" reads 0 VAC	the start button is open-circuited	the secondary winding of the control transformer is open-circuited	the fuse is blown	**the stop button is open-circuited**
264	As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "X1" to "X2" reads 115 VAC; "1" to "X2" reads 115 VAC; "2" to "X2" reads 115 VAC; and "3" to "X2" reads 0 VAC	**the start button is open-circuited**	the secondary winding of the control transformer is open-circuited	the fuse is blown	the stop button is open-circuited
265	As shown in figure "A" of the illustration, if the applied voltage is 12 volts DC, the resistance of R1 is 110 ohms, and R2 is 10 k ohms, what is the voltage measured across R1 when the switch is closed?	0.013 volts	0.063 volts	**0.131 volts**	0.63 volts

ID #	Question	Choice A	Choice B	Choice C	Choice D
266	As shown in figure "A" of the illustration, if the operation selector switch is allowed to remain in the 'Controller' mode after testing of the steering gear, how will the rudder respond?	**It will not respond to commands from the helm**	It will move in one direction only regardless of the movement of the helm	It will respond only to the output of the differential repeater	It will stop moving only when the helm is counter-rotated to put the pump at neutral stroke
267	As shown in figure "A" of the illustration, in terms of frequency response characteristics, the various filter circuits illustrated represent what type of filter?	**low-pass filter**	high-pass filter	resonant band-pass filter	interference filter
268	As shown in figure "A" of the illustration, the actual rudder angle repeatback signal originates at what device and is delivered to what other device?	**originates at the power unit and delivered to the amplifier**	originates at the power unit and delivered to the control potentiometer	originates at the amplifier and delivered to the power unit	originates at the amplifier and delivered to the control potentiometer
269	As shown in figure "A" of the illustration, the load-commutated inverter drive illustrated has how many pulses?	3	**6**	9	12
270	As shown in figure "A" of the illustration, under what conditions is the test proving unit used in conjunction with the high voltage probe?	before using the probe each time for detecting the presence of and verifying the absence of voltage only	after using the probe each time for detecting the presence of and verifying the absence of voltage only	**before and after using the probe each time for detecting the presence of and verifying the absence of voltage only**	whenever it is suspected that the probe is not accurately detecting the presence of voltage
271	As shown in figure "A" of the illustration, under what conditions will the thyristor conduct?	when the anode is more negative than the cathode and when the gate is briefly pulsed with a voltage more negative than the cathode	when the anode is more negative than the cathode and when the gate is briefly pulsed with a voltage more positive than the cathode	**when the anode is more positive than the cathode and when the gate is briefly pulsed with a voltage more positive than the cathode**	when the anode is more positive than the cathode and when the gate is briefly pulsed with a voltage more negative than the cathode
272	As shown in figure "A" of the illustration, what are the electrode/lead designations for "A", "K", and "G" respectively for the thyristor control, also known as a silicon-controlled rectifier?	"A" is the arsenic doping electrode "K" is the cathode "G" is the gate	"A" is the anode "K" is the klyptron "G" is the gate	"A" is the anode "K" is the cathode "G" is the germanium lead	**"A" is the anode** **"K" is the cathode** **"G" is the gate**
273	As shown in figure "A" of the illustration, what causes the Boolean output at "Q" to be set to 1 if PV is set at 10?	When the combined total counted pulses at CU and R reaches the value of 10.	When the counted pulses at Q reaches the value of 10.	When the counted pulses at R reaches the value of 10.	**When the counted pulses at CU reaches the value of 10.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
274	As shown in figure "A" of the illustration, what causes the Boolean output at "Q" to be set to 1?	When the input to IN goes to 0, the time decrements from the preset time at PT to zero.	**When the input to IN goes to 1, the time increments from zero to the preset time at PT.**	When the input to IN goes to 1, the time decrements from the preset time at ET to zero.	After the input to IN goes to 0, the time increments from zero to the preset time at ET.
275	As shown in figure "A" of the illustration, what causes the Boolean output at "Q" to be set to 1?	When the counted pulses at CU decrement from the preset value at PV to zero.	**When the counted pulses at CU increment from zero to the preset value at PV.**	When the counted pulses at R decrement from the preset value at PV to zero.	When the counted pulses at R increment from zero to the preset value at PV.
276	As shown in figure "A" of the illustration, what input conditions are required to produce an output?	Either "Input 1" or "Input 2" must be closed AND either "Input 3" or "Input 4" must be closed.	**Either "Input 1" or "Input 2" must be closed OR both "Input 3" and "Input 4" must be closed.**	Both "Input 1 and "Input 2" must be closed AND either "Input 3" or "Input 4" must be closed.	Both "Input 1" and "Input 2" must be closed OR both "Input 3" and "Input 4" must be closed.
277	As shown in figure "A" of the illustration, what is the configuration of the operational amplifier?	**inverting amplifier**	non-inverting amplifier	summing amplifier	differential amplifier
278	As shown in figure "A" of the illustration, what is the configuration of the operational amplifier?	inverting amplifier	**non-inverting amplifier**	summing amplifier	differential amplifier
279	As shown in figure "A" of the illustration, what is the primary reason that the propulsion transformers are configured differently so as to produce a 30 degree phase shift in the pulses between the two synchroconverters supplying separate stator windings?	to maximize motor power output	to minimize AC sine wave distortion	**to minimize motor shaft vibration**	to maximize motor power factor
280	As shown in figure "A" of the illustration, what is the purpose of the "test button"?	The test button is used to reset the now open normally closed relay contacts after an overload trip.	The test button is used to test the actual current trip value of the overload relay.	**The test button is used to mimic an overload to test the trip function of the overload relay.**	The test button is used to reset the now closed normally open relay contacts after an overload trip.
281	As shown in figure "A" of the illustration, what is the purpose of the frequency converter?	to invert constant frequency AC output from the shaft generator to DC and then rectify the DC to a variable frequency AC output for delivery to the bus	to invert variable frequency AC output from the shaft generator to DC and then invert the DC to a constant frequency AC output for delivery to the bus	to rectify constant frequency AC output from the shaft generator to DC and then invert the DC to a variable frequency AC output for delivery to the bus	**to rectify variable frequency AC output from the shaft generator to DC and then invert the DC to a constant frequency AC output for delivery to the bus**

ID #	Question	Choice A	Choice B	Choice C	Choice D
282	As shown in figure "A" of the illustration, what is the purpose of the thyristor control?	**The thyristor is a silicon-controlled rectifier used to convert the exciter AC output to DC and to control the DC current .to the main field**	The thyristor is a conventional rectifier diode used to convert the exciter AC output to DC.	The thyristor is a current control device used to control the AC current to the main field.	The thyristor is a temperature sensitive resistor used to sense main field temperature
283	As shown in figure "A" of the illustration, what is true concerning the illustrated frequency response curve?	Low frequencies below the cutoff-frequency are passed and high frequencies above the cut-off frequency are attenuated.	**Low frequencies below the cutoff-frequency are attenuated and high frequencies above the cut-off frequency are passed.**	Low frequencies below the cutoff-frequency are attenuated and high frequencies above the cut-off frequency are attenuated.	Low frequencies below the cutoff-frequency are passed and high frequencies above the cut-off frequency are passed.
284	As shown in figure "A" of the illustration, what load type or combination of load types would produce the voltage and current waveforms shown with the resulting phase shift?	approximately equal amounts of both capacitive and resistive loads connected across the source	approximately equal amounts of both capacitive and inductive loads connected across the source	**approximately equal amounts of both inductive and resistive loads connected across the source**	only inductive loads connected across the source
285	As shown in figure "A" of the illustration, what phenomenon is illustrated with respect to electrical cables and ground?	associative capacitance	associative inductance	**distributive capacitance**	distributive inductance
286	As shown in figure "A" of the illustration, what statement is true concerning the "full-load amp adjustment"?	The full-load amp adjustment allows setting the overload relay trip value lower to compensate for low ambient temperatures so as to prevent nuisance trips.	The full-load amp adjustment allows setting the overload relay trip value lower to compensate for high ambient temperatures so as to achieve better motor protection.	**The full-load amp adjustment allows setting the overload relay trip value higher to compensate for high ambient temperatures so as to prevent nuisance trips.**	The full-load amp adjustment allows setting the overload relay trip value higher to compensate for low ambient temperatures so as to achieve better motor protection.
287	As shown in figure "A" of the illustration, what statement is true concerning the "reset button"?	To reset the overload relay, the reset button is generally accessed by opening the motor starter enclosure door with no waiting period required.	To reset the overload relay, the reset button is generally accessed by pushing a reset button on the motor starter enclosure door with no waiting period required.	To reset the overload relay, the reset button is generally accessed by opening the motor starter enclosure door after waiting for the mechanism to cool.	**To reset the overload relay, the reset button is generally accessed by pushing a reset button on the motor starter enclosure door after waiting for the mechanism to cool.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
288	As shown in figure "A" of the illustration, what statement is true concerning the door interlock?	The door cannot be opened unless the disconnect switch is open, and if the door is open the disconnect switch cannot be opened.	The door cannot be opened unless the disconnect switch is closed and if the door is open the disconnect switch cannot be opened.	**The door cannot be opened unless the disconnect switch is open, and if the door is open the disconnect switch cannot be closed.**	The door cannot be opened unless the disconnect switch is closed and if the door is open the disconnect switch cannot be closed.
289	As shown in figure "A" of the illustration, what statement is true concerning the safety disconnect switch?	When the disconnect switch is opened, the fuses are automatically disconnected from ground for maintenance safety.	**When the disconnect switch is opened, the fuses are automatically grounded for maintenance safety.**	When the disconnect switch is closed, the fuses are automatically grounded for maintenance safety.	When the disconnect switch is closed, the fuses are automatically disconnected from ground for maintenance safety.
290	As shown in figure "A" of the illustration, what statement is true concerning the voltage sensing unit?	The voltage sensor delivers a relatively low value of single phase AC signal voltage proportional to the alternator output voltage to the comparator.	**The voltage sensor delivers a relatively low value of DC signal voltage proportional to the alternator output voltage to the comparator.**	The voltage sensor delivers an AC signal voltage equal in magnitude to the alternator output voltage to the comparator.	The voltage sensor delivers a DC signal voltage equal in magnitude to the alternator output voltage to the comparator.
291	As shown in figure "A" of the illustration, what statement is true?	The set value and actual values are analog signals and the arithmetic processor is an analog computer	The set value and actual values are digital signals and the arithmetic processor is an analog computer	The set value and actual values are digital signals and the arithmetic processor is a digital computer	**The set value and actual values are analog signals and the arithmetic processor is a digital computer**
292	As shown in figure "A" of the illustration, what type of converter unit is represented?	de-multiplexer	multiplexer	digital to analog converter	**analog to digital converter**
293	As shown in figure "A" of the illustration, what type of ground fault detection system is illustrated?	a neutral to ground current transformer system	a core-balance current transformer system	a set of ground detection lamps system	**a direct current injection system**
294	As shown in figure "A" of the illustration, what would be the circuit impedance if the capacitive reactance is 10 ohms and the resistance is 10 ohms?	4.47 ohms	6.32 ohms	**14.14 ohms**	20 ohms
295	As shown in figure "A" of the illustration, which illustrates the effect of a applying a particular type of control, what type of control is applied?	derivative control only	integral control only	**proportional control only**	both proportional and derivative control
296	As shown in figure "A" of the illustration, which statement is true?	Inputs to "R" may be any integer.	**Inputs to "R" are the binary values of either 1 or 0.**	Inputs to "R" may be any analog value.	Inputs to "R" may be any digital value.

ID #	Question	Choice A	Choice B	Choice C	Choice D
297	As shown in figure "A" of the illustration, with a digital multimeter set up as an ohmmeter, what set of readings would be consistent with an open in phase "C" of the single circuit, wye-connected stator windings as shown?	T1 to T2: "1.8 ohms"; T2 to T3: "OL ohms"; T3 to T1: "OL ohms"	T1 to T2: "OL ohms"; T2 to T3: "1.8 ohms"; T3 to T1: "OL ohms"	**T1 to T2: "OL ohms"; T2 to T3: "OL ohms"; T3 to T1: "1.8 ohms"**	T1 to T2: "OL ohms"; T2 to T3: "1.8 ohms"; T3 to T1: "1.8 ohms"
298	As shown in figure "A" of the illustration, with respect to the common equipment grounding conductor, what statement is true?	The common equipment grounding conductor is solidly-grounded at the source and this is the most common arrangement onboard merchant vessels.	The common equipment grounding conductor is solidly-grounded at the source and this is the least common arrangement onboard merchant vessels.	**The common equipment grounding conductor is insulated from the source and this is the most common arrangement onboard merchant vessels.**	The common equipment grounding conductor is insulated from the source and this is the least common arrangement onboard merchant vessels.
299	As shown in figure "A" of the illustration, with the switch closed what statement is true if 'R1' and 'R2' have unequal resistance values?	The voltage drop across 'R1' will not be equal to the voltage drop across 'R2'.	The current flow through 'R1' will equal the current flow through 'R2'.	The energy dissipated in 'R1' will be the same as the energy dissipated in 'R2'.	**The current flow through 'R1' will differ from the current flow through 'R2'.**
300	As shown in figure "B" in the illustrated block diagram of a central operating system configured for supervisory control, what is the function of the block "ANALOG (A-D MUX)"?	**A high speed solid-state switching device called a multiplexer capable scanning a large number of analog sensors in a short period of time and converting these signals to digital values for processing by the CPU.**	A high speed solid-state switching device called a multiplexer capable scanning a large number of digital sensors in a short period of time and converting these signals to analog values for processing by the CPU.	A low speed solid-state switching device called a multiplexer capable scanning a small number of analog sensors in a long period of time and converting these signals to digital values for processing by the CPU.	A low speed solid-state switching device called a multiplexer capable scanning a small number of digital sensors in a long period of time and converting these signals to analog values for processing by the CPU.
301	As shown in figure "B" of the illustrated analog PID controller, what is the primary purpose of "U1"?	to produce a signal voltage that is proportional to error signal voltage	to produce a signal voltage that is proportional to the sum of all past error signal voltages multiplied by time	to produce a signal voltage that is proportional to the rate of change of the current signal voltage	**to produce an error signal that is the difference between the process variable feedback signal voltage and the setpoint signal voltage**

ID #	Question	Choice A	Choice B	Choice C	Choice D
302	As shown in figure "B" of the illustrated analog PID controller, what is the primary purpose of "U2"?	**to produce a signal voltage that is proportional to error signal voltage**	to produce a signal voltage that is proportional to the sum of all past error signal voltages multiplied by time	to produce a signal voltage that is proportional to the rate of change of the current error signal voltage	to produce an error signal that is the difference between the process variable feedback signal voltage and the setpoint signal voltage
303	As shown in figure "B" of the illustrated analog PID controller, what is the primary purpose of "U3"?	to produce a signal voltage that is proportional to error signal voltage	**to produce a signal voltage that is proportional to the sum of all past error signal voltages multiplied by time**	to produce a signal voltage that is proportional to the rate of change of the current error signal voltage	to produce an error signal that is the difference between the process variable feedback signal voltage and the setpoint signal voltage
304	As shown in figure "B" of the illustrated analog PID controller, what is the primary purpose of "U4"?	to produce a signal voltage that is proportional to error signal voltage	to produce a signal voltage that is proportional to the sum of all past error signal voltages multiplied by time	**to produce a signal voltage that is proportional to the rate of change of the current error signal voltage**	to produce an error signal that is the difference between the process variable feedback signal voltage and the setpoint signal voltage
305	As shown in figure "B" of the illustrated block diagram for a central operating system configured for supervisory control, what is becoming the industry standard for transmission of analog signals for a measured variable?	1volt to 5 volts	-10 volts to 0volts to +10 volts	10 milliamps to 50 milliamps	**4 milliamps to 20 milliamps**
306	As shown in figure "B" of the illustrated block diagram of a central operating system configured for supervisory control, what statement is true concerning the block "COMPUTER" with respect to closed-loop control processes?	The computer has no role in the various closed-loop control processes regardless of the control mode.	The computer normally has no role in the various closed-loop control processes. It is only used for backup control purposes.	**The computer provides the setpoint input data to the analog controllers, but the analog controllers actually control the closed-loop processes.**	The computer provides the setpoint input data to the process control loop, as well as the measured variable data. The analog controllers are only used for manual backup control.

ID #	Question	Choice A	Choice B	Choice C	Choice D
307	As shown in figure "B" of the illustrated block diagram of the signal processing flow path, what does the block "FILTER" represent?	**These devices remove 60 Hz, voltage spike, and RF signal noises letting only sensed variable signal data to pass through.**	These are high speed solid-state switching devices able to scan many transducers in a short period of time.	These devices remove digital data signal noise letting only analog signal data to pass through.	These devices remove analog data signal noise letting only digital signal data to pass through.
308	As shown in figure "B" of the illustrated block diagram of the signal processing flow path, what does the block "TRANSDUCER" represent?	These are sensing and transmitting devices designed to sense and measure a physical parameter and convert it to a proportional pneumatic signal.	**These are sensing and transmitting devices designed to sense and measure a physical parameter and convert it to a proportional analog electrical signal.**	These are sensing and transmitting devices designed to sense and measure a physical parameter and convert it to a proportional digital electrical signal.	These are sensing and transmitting devices designed to sense and measure a physical parameter and convert it to a proportional electromechanical force.
309	As shown in figure "B" of the illustrated function block for a PLC PID controller, to what input is the actual analog signal of the measured value delivered?	**PV**	SP	XO	KP
310	As shown in figure "B" of the illustrated function block for a PLC PID controller, to what input is the value of the derivative time constant delivered?	X0	KP	TI	**TD**
311	As shown in figure "B" of the illustrated function block for a PLC PID controller, to what input is the value of the integral time constant delivered?	X0	KP	**TI**	TD
312	As shown in figure "B" of the illustrated function block for a PLC PID controller, to what input is the value of the proportional control constant delivered?	X0	**KP**	TI	TD
313	As shown in figure "B" of the illustrated ladder diagram for a programmable logic controller, what statement is true?	Pressing the start button will automatically cause output loads "Out 1", "Out 2", and "Out 3" to energize without any further inputs.	Pressing the start button will automatically cause output loads "Out 1" and "Out 2" only to energize without any further inputs.	Pressing the start button will automatically cause output loads "Out 1" and "Out 3" only to energize without any further inputs.	**Pressing the start button will automatically cause the output load "Out 1" only to energize without any further inputs.**
314	As shown in figure "B" of the illustrated manual motor controller, what statement is true concerning the starting of the motor?	the motor can be started at any speed	**the motor must be started at the lowest speed**	the motor can be started at any speed except the highest speed	the motor can be started at either of the two lower speeds

ID #	Question	Choice A	Choice B	Choice C	Choice D
315	As shown in figure "B" of the illustrated manual secondary resistance motor controller, at how many operating speeds does the motor run from start-up to rated speed?	1	2	3	**4**
316	As shown in figure "B" of the illustrated motor protection schemes, what statement is true regarding the trigger type fuses?	A trigger fuse, when blown, trips the motor on low voltage, providing added protection beyond the capability of the under-voltage relay.	**A trigger fuse, when blown, trips the motor on single phasing, providing added protection beyond the capability of the differential, single phasing characteristics of the combined overload relay.**	A trigger fuse, when blown, trips the motor on sustained overload, providing added protection beyond the capability of the over-current, inverse time characteristics of the combined overload relay.	A trigger fuse, when blown, trips the motor on a ground fault, providing added protection beyond the capability of the ground fault characteristics of the combined overload relay.
317	As shown in figure "B" of the illustrated PLC output unit, what switching technology is used to control the output load either being energized or de-energized as appropriate?	a phototransistor controlled electro-magnetic relay	a photodiode controlled electro-magnetic relay	**a phototransistor controlled triac**	a phototransistor controlled transistor (Darlington pair)
318	As shown in figure "B" of the illustrated PLC sub-circuit, what type of circuit is depicted?	**AC input unit**	AC output unit	DC input unit	DC output unit
319	As shown in figure "B" of the illustrated self-contained recovery unit connection diagrams, what is the recovery method supported by the connection scheme?	direct liquid recovery	**direct vapor recovery**	liquid recovery/push-pull	vapor recovery/push-pull
320	As shown in figure "B" of the illustrated solidly grounded distribution system with possible ground faults, under what conditions would an outage likely occur due to a ground fault causing a circuit breaker to trip?	**a single ground fault associated with any phase**	two ground faults associated with the same phase	two ground faults associated with different phases	ground faults do not result in outages regardless of the number and location of faults
321	As shown in figure "B" of the illustrated three phase alternator showing the stator winding connections, what can be said about the output line current?	line current is the phase current divided by 1.73	**line current is 1.73 times the phase current**	there is no relationship between line current and phase current	line current is equal to phase current
322	As shown in figure "B" of the illustrated three phase alternator showing the stator winding connections, what can be said about the output line voltage?	line voltage is 1.73 times the phase voltage	**line voltage is equal to the phase voltage**	line voltage is phase voltage divided by 1.73	there is no relationship between line voltage and phase voltage

ID #	Question	Choice A	Choice B	Choice C	Choice D
323	As shown in figure "B" of the illustration of the motors of the solidly grounded distribution system, assuming all three motors are running, what statement is true if the following current readings are taken with an AC clamp-on ammeter clamped around the entire cable rather than individual conductors of a cable? Common loop: 3 amps Motor #1 loop: 0 amps Motor #2 loop: 3 amps Motor #3 loop: 0 amps	None of the motors are grounded, but motors #1 and #3 are unloaded, while motor #2 is carrying a normal load.	Motors #1 and #3 are grounded, while motor #2 is free of grounds.	None of the motors are grounded, but motor #2 is unloaded, while motors #1 and #3 are carrying a normal load.	**Motor #2 is grounded, while motors #1 ands #3 are free of grounds.**
324	As shown in figure "B" of the illustration, after the high voltage circuit has been properly de-energized and isolated, and tested for the absence of voltage, what is the proper sequence for grounding high voltage motor terminals prior to commencing work?	the motor terminal connections to the common ground connection should be made first and the common hull ground connection to the common ground connection should be made last	**the common hull ground connection to the common ground connection should be made first and the motor terminal connections to the common ground connection should be made last**	the common hull ground and the motor terminal connections should all be made to the common ground connection simultaneously	the common hull ground and the motor terminal connections can be made to the common ground connection in any sequence
325	As shown in figure "B" of the illustration, due to the effect of distributed capacitance, what would be the voltage of each bus phase with respect to the common equipment grounding conductor (hull ground)?	240 VAC	**277 VAC**	480 VAC	830 VAC
326	As shown in figure "B" of the illustration, for the illustrated AC electrical system power triangle, which value represents the active power for the system?	kvar	kVA	**kW**	kW divided by kVA
327	As shown in figure "B" of the illustration, for the illustrated AC electrical system power triangle, which value represents the power factor for the system?	kvar divided by kW	kvar divided by kVA	kW divided by kvar	**kW divided by kVA**
328	As shown in figure "B" of the illustration, how many degrees phase shift are associated with the outputs of each of the six-pulse converters ?	**30**	45	60	90
329	As shown in figure "B" of the illustration, if the source voltage at the branch circuit breaker is 220 VAC, what would be the applied voltage to the load?	**55 volts**	110 volts	165 volts	220 volts

ID #	Question	Choice A	Choice B	Choice C	Choice D
330	As shown in figure "B" of the illustration, in terms of frequency response characteristics, the various filter circuits illustrated represent what type of filter?	low-pass filter	**high-pass filter**	resonant band-pass filter	interference filter
331	As shown in figure "B" of the illustration, the load-commutated inverter drive illustrated has how many pulses?	3	6	9	**12**
332	As shown in figure "B" of the illustration, the self-test of the OCR performance is applied with a setting of 6 times the full load current and a trip time of 10 seconds is observed, which agrees with the manufacturers current/time characteristics. According to figure "C" of the illustration, under actual operation, how long would the trip time be if the motor was drawing 3 times the full load amperage due to a mechanical overload?	5 seconds	10 seconds	**15 seconds**	25 seconds
333	As shown in figure "B" of the illustration, what causes the Boolean output at "Q" to be set to 1?	**When the counted pulses at CD decrement from the preset value at PV to zero.**	When the counted pulses at CD increment from zero to the preset value at PV.	When the counted pulses at LD decrement from the preset value at PV to zero.	When the counted pulses at LD increment from zero to the preset value at PV.
334	As shown in figure "B" of the illustration, what does the M-G set's three-phase drive motor mechanically drive?	the field rectifier	the DC motor armature	**the DC generator armature**	the DC generator field
335	As shown in figure "B" of the illustration, what is the actual full-load current setting for the overload relay as pictured?	**20 amps**	24 amps	35 amps	80 amps
336	As shown in figure "B" of the illustration, what is the appropriate action to take?	The motor should be meggered more often as the result of the 2010 megger reading.	No concern should be given, as the motor winding insulation resistance reading is still acceptable even based on the 2010 result.	**Preparations should be made either to refurbish or replace the motor in question based on the 2010 result.**	Another 5 years of service life can be anticipated prior to having to refurbish or replace the motor based on the 2010 result.
337	As shown in figure "B" of the illustration, what is the operating principle of the current transformer illustrated?	**the current transformer output current is zero with no ground fault due to balanced individual line currents**	the current transformer current is zero with no ground fault due to unbalanced individual line currents	the current transformer output current is zero with a ground fault due to balanced individual line currents	the current transformer current is zero with a ground fault due to unbalanced individual line currents

ID #	Question	Choice A	Choice B	Choice C	Choice D
338	As shown in figure "B" of the illustration, what is the proper sequence for disconnecting the ground straps after completion of work on the high voltage motor?	**the motor terminal connections from the common ground connection should be disconnected first and the common hull ground connection from the common ground connection should be disconnected last**	the common hull ground connection from the common ground connection should be disconnected first and the motor terminal connections from the common ground connection should be disconnected last	the common hull ground and the motor terminal connections should all be disconnected from the common ground connection simultaneously	the common hull ground and the motor terminal connections can be disconnected from the common ground connection in any sequence
339	As shown in figure "B" of the illustration, what is the purpose of the synchronous compensator?	provide active power to the mains as the frequency converter has the ability to provide only reactive power	**provide reactive power to the mains as the frequency converter has the ability to provide only active power**	provide additional active power to the mains beyond the capability of the frequency converter	provide additional reactive power to the mains beyond the capability of the frequency converter
340	As shown in figure "B" of the illustration, what is true concerning the illustrated frequency response curve?	**Low frequencies below the cutoff-frequency are passed and high frequencies above the cut-off frequency are attenuated.**	Low frequencies below the cutoff-frequency are attenuated and high frequencies above the cut-off frequency are passed.	Low frequencies below the cutoff-frequency are attenuated and high frequencies above the cut-off frequency are attenuated.	Low frequencies below the cutoff-frequency are passed and high frequencies above the cut-off frequency are passed.
341	As shown in figure "B" of the illustration, what load type or combination of load types would produce the voltage, current, and power waveforms shown?	both capacitive and resistive loads connected across the source	both inductive and resistive loads connected across the source	only capacitive loads connected across the source	**equal amounts of capacitive and inductive loads along with resistive loads connected across the source**
342	As shown in figure "B" of the illustration, what statement is true concerning "regenerating" operation?	**by applying torque in the opposite direction of rotation direction, the motor briefly regenerates power back into the mains, which rapidly slows down the motor**	by applying torque in the same direction of rotation direction, the motor briefly regenerates power back into the mains, which rapidly slows down the motor	by applying torque in the opposite direction of rotation direction, the motor briefly regenerates power back into the mains, which rapidly speeds up the motor	by applying torque in the same direction of rotation direction, the motor briefly regenerates power back into the mains, which rapidly speeds up the motor
343	As shown in figure "B" of the illustration, what type of converter unit is represented?	de-multiplexer	multiplexer	**digital to analog converter**	analog to digital converter

ID #	Question	Choice A	Choice B	Choice C	Choice D
344	As shown in figure "B" of the illustration, what type of overload relay for motor protection is illustrated?	Thermal bimetallic	Thermal solder-pot	Electromagnetic	**Electronic**
345	As shown in figure "B" of the illustration, what would be the circuit impedance if the inductive reactance is 10 ohms and the resistance is 10 ohms?	4.47 ohms	6.32 ohms	**14.14 ohms**	20 ohms
346	As shown in figure "B" of the illustration, when the DC motor in figure "A" is accelerating from base speed to maximum speed what are the motor's operational characteristics?	The motor torque is constant and the motor horsepower decreases with increasing speed.	The motor torque and motor horsepower both increase with increasing speed.	**The motor horsepower is constant and the motor torque decreases with increasing speed.**	The motor torque and motor horsepower both decrease with increasing speed.
347	As shown in figure "B" of the illustration, when the DC motor in figure "A" is accelerating from minimum speed to base speed what are the motor's operational characteristics?	**The motor torque is constant and the motor horsepower increases with increasing speed.**	The motor torque and motor horsepower both increase with increasing speed.	The motor horsepower is constant and the motor torque increases with increasing speed.	The motor torque and motor horsepower both decrease with increasing speed.
348	As shown in figure "B" of the illustration, when the DC motor in figure "A" is operating at base speed what are the armature and field characteristics?	The motor is operating at minimum armature voltage and minimum field current.	The motor is operating at minimum armature voltage and maximum field current.	The motor is operating at maximum armature voltage and minimum field current.	**The motor is operating at maximum armature voltage and maximum field current.**
349	As shown in figure "B" of the illustration, when the DC motor in figure "A" is operating at maximum speed what are the armature and field characteristics?	The motor is operating at minimum armature voltage and minimum field current.	The motor is operating at minimum armature voltage and maximum field current.	**The motor is operating at maximum armature voltage and minimum field current.**	The motor is operating at maximum armature voltage and maximum field current.
350	As shown in figure "B" of the illustration, when the DC motor in figure "A" is operating at minimum speed what are the armature and field characteristics?	The motor is operating at minimum armature voltage and minimum field current.	**The motor is operating at minimum armature voltage and maximum field current.**	The motor is operating at maximum armature voltage and minimum field current.	The motor is operating at maximum armature voltage and maximum field current.
351	As shown in figure "B" of the illustration, which illustrates the effect of a applying a particular type of control, what type of control is applied?	**derivative control only**	integral control only	proportional control only	both proportional and derivative control
352	As shown in figure "B" of the illustration, which of the operations listed will happen when the 'jog button' is pushed?	Coil 'CR' energizes thus closing both 'CR' contacts.	Coil "M" energizes thus opening contact "M".	**Coil "M" energizes thus closing contact "M".**	Coil 'CR' energizes thus opening both 'CR' contacts.

ID #	Question	Choice A	Choice B	Choice C	Choice D
353	As shown in figure "B" of the illustration, which statement is true?	Inputs to "IN" may be any integer.	**Inputs to "IN" are the binary values of either 1 or 0.**	Inputs to "IN" may be any analog value.	Inputs to "IN" may be any digital value.
354	As shown in figure "B" of the illustration, which statement is true?	Inputs to "CD" may be any integer.	**Inputs to "CD" are the binary values of either 1 or 0.**	Inputs to "CD" may be any analog value.	Inputs to "CD" may be any digital value.
355	As shown in figure "B" of the illustration, with a digital multimeter set up as an ohmmeter, what set of readings would be consistent with an open in a phase of the single circuit, delta-connected stator windings as shown?	**T1 to T2: "3.6 ohms"; T2 to T3: "1.8 ohms"; T3 to T1: "1.8 ohms"**	T1 to T2: "OL ohms"; T2 to T3: "1.8 ohms"; T3 to T1: "1.8 ohms"	T1 to T2: "1.8 ohms"; T2 to T3: "OL ohms"; T3 to T1: "1.8 ohms"	T1 to T2: "1.8 ohms"; T2 to T3: "3.6 ohms"; T3 to T1: "1.8 ohms"
356	As shown in figure "B" of the illustration, with respect to the common equipment grounding conductor, what statement is true?	The common equipment grounding conductor is solidly-grounded at the source and this is the most common arrangement onboard merchant vessels.	**The common equipment grounding conductor is solidly-grounded at the source and this is the least common arrangement onboard merchant vessels.**	The common equipment grounding conductor is insulated from the source and this is the most common arrangement onboard merchant vessels.	The common equipment grounding conductor is insulated from the source and this is the least common arrangement onboard merchant vessels.
357	As shown in figure "C" of the illustrated PLC output unit, what switching technology is used to control the output load either being energized or de-energized as appropriate?	a phototransistor controlled electro-magnetic relay	a photodiode controlled electro-magnetic relay	a phototransistor controlled triac	**a phototransistor controlled transistor (Darlington pair)**
358	As shown in figure "C" of the illustration, due to the effect of distributed capacitance, what would be the voltage of bus phase "C" with respect to the common equipment grounding conductor (hull ground)?	**0 VAC**	240 VAC	277 VAC	480 VAC
359	As shown in figure "C" of the illustration, due to the effect of distributed capacitance, what would be the voltage of bus phases "A" and "B" with respect to the common equipment grounding conductor (hull ground)?	0 VAC	240 VAC	277 VAC	**480 VAC**
360	As shown in figure "C" of the illustration, what are the purposes of the coupling capacitor Cc and the bypass capacitor Cbp respectively.	**Cc blocks any DC component associated with the input from reaching the base Cbp helps minimize degeneration of the AC output signal**	Cc blocks any AC component associated with the input from reaching the base Cbp helps minimize degeneration of the AC output signal	Cc blocks any DC component associated with the input from reaching the base Cbp helps maximize degeneration of the AC output signal	Cc blocks any AC component associated with the input from reaching the base Cbp helps maximize degeneration of the AC output signal

ID #	Question	Choice A	Choice B	Choice C	Choice D
361	As shown in figure "C" of the illustration, what input conditions are required to produce an output?	**Either "Input 1" or "Input 3" must be closed AND both "Input 2" and "Input 4" must be closed.**	Either "Input 1" or "Input 3" must be closed OR either "Input 2" or "Input 4" must be closed.	Both "Input 1 and "Input 3" must be closed AND both "Input 2" and "Input 4" must be closed.	Both "Input 1" and "Input 2" must be closed OR either "Input 2" or "Input 4" must be closed.
362	As shown in figure "C" of the illustration, what is the configuration of the operational amplifier?	inverting amplifier	non-inverting amplifier	summing amplifier	**differential amplifier**
363	As shown in figure "C" of the illustration, what is true concerning the illustrated frequency response curve?	Low frequencies below the lower cutoff-frequency are passed and high frequencies above the upper cut-off frequency are attenuated.	Low frequencies below the lower cutoff-frequency are attenuated and high frequencies above the upper cut-off frequency are passed.	**Low frequencies below the lower cutoff-frequency are attenuated and high frequencies above the upper cut-off frequency are attenuated.**	Low frequencies below the lower cutoff-frequency are passed and high frequencies above the upper cut-off frequency are passed.
364	As shown in figure "C" of the illustration, what load type or combination of load types would produce the voltage, current, and power waveforms shown?	both capacitive and resistive loads connected across the source	**both inductive and resistive loads connected across the source**	only inductive loads connected across the source	equal amounts of capacitive and inductive loads along with resistive loads connected across the source
365	As shown in figure "C" of the illustration, what type of converter unit is represented?	de-multiplexer	**multiplexer**	digital to analog converter	analog to digital converter
366	As shown in figure "C" of the illustration, what type of timer is represented?	**on-delay timer**	off-delay timer	on-off delay timer	pulse timer
367	As shown in figure "C" of the illustration, what would a "0" data bit signal level be during serial communications?	24 V	**+12 V**	0 V	-12 V
368	As shown in figure "C" of the illustration, what would a "1" data bit signal level be during serial communications?	24 V	+12 V	0 V	**-12 V**
369	As shown in figure "C" of the illustration, what would be the circuit impedance if the capacitive reactance is 10 ohms, the inductive reactance is 10 ohms and the resistance is 10 ohms?	5.48 ohms	**10 ohms**	14.14 ohms	30 ohms
370	As shown in figure "C" of the illustration, which illustrates the effect of a applying a particular type of control, what type of control is applied?	derivative control only	integral control only	proportional control only	**both proportional and derivative control**
371	As shown in figure "C" of the illustration, with a digital multimeter set up as an ohmmeter, what set of readings would be consistent with an open in a phase of the single circuit, delta-connected stator windings separated out as shown?	1 to 4: "0.9 ohms"; 2 to 5: "1.8 ohms"; 3 to 6: "1.8 ohms"	**1 to 4: "OL ohms"; 2 to 5: "1.8 ohms"; 3 to 6: "1.8 ohms"**	1 to 4: "1.8 ohms"; 2 to 5: "1.8 ohms"; 3 to 6: "1.8 ohms"	1 to 4: "OL ohms"; 2 to 5: "3.6 ohms"; 3 to 6: "1.8 ohms"

ID #	Question	Choice A	Choice B	Choice C	Choice D
372	As shown in figure "D" of the illustrated digital power meter, what display of text represents the active (true) power consumed by the load?	**3.5 kW**	3.9 kVA	0.89 PF	0.3 kVAR
373	As shown in figure "D" of the illustrated digital power meter, what display of text represents the apparent power consumed by the load?	3.5 kW	**3.9 kVA**	0.89 PF	0.3 kVAR
374	As shown in figure "D" of the illustrated digital power meter, what display of text represents the reactive power consumed by the load?	3.5 kW	3.9 kVA	0.89 PF	**0.3 kVAR**
375	As shown in figure "D" of the illustrated digital power meter, what type of single phase load is under test for power measurement?	a purely inductive load	**an inductive-resistive load**	a resistive-capacitive load	a purely resistive load
376	As shown in figure "D" of the illustration as compared to figure "C", what is the purpose for the "wye" or "delta" connected capacitors when the loads are similar to that illustrated in figure "A"?	assist in ground detection	correct any imbalances in the load	**improve power factor for the plant**	increase starting torque for the motors
377	As shown in figure "D" of the illustration, what load type or combination of load types would produce the voltage, current, and power waveforms shown?	both capacitive and resistive loads connected across the source	both inductive and resistive loads connected across the source	**only inductive loads connected across the source**	equal amounts of capacitive and inductive loads along with resistive loads connected across the source
378	As shown in figure "D" of the illustration, what type of timer is represented?	on-delay timer	**off-delay timer**	on-off delay timer	pulse timer
379	As shown in figure "D" of the illustration, what would be the circuit impedance if the capacitive reactance is 10 ohms and the resistance is 10 ohms?	4.47 ohms	**7.07 ohms**	14.14 ohms	20 ohms
380	As shown in figure "E" of the illustration, what type of timer is represented?	on-delay timer	off-delay timer	on-off delay timer	**pulse timer**
381	As shown in figure "E" of the illustration, what would be the circuit impedance if the inductive reactance is 10 ohms and the resistance is 10 ohms?	4.47 ohms	**7.07 ohms**	14.14 ohms	20 ohms
382	As shown in figure "F" of the illustration, what would be the circuit impedance if the capacitive reactance is 10 ohms, the inductive reactance is 10 ohms and the resistance is 10 ohms?	5.48 ohms	**10 ohms**	14.14 ohms	30 ohms
383	As shown in figure A" of the illustrated motor nameplate, how much current could the motor safely draw on a continuous basis at sea level without overheating?	142 amps	156 amps	163 amps	**187 amps**

ID #	Question	Choice A	Choice B	Choice C	Choice D
384	As shown in figure A" of the illustrated motor nameplate, what is the service factor at sea level?	1.00	**1.15**	17.5	89.7
385	As shown in figures "A" and "B" of the illustrated PLC ladder and input/output timing diagrams, the application of the on-delay timer is used to produce what effect?	on-delay	**off-delay**	on-off cycle	pulse
386	As shown in figures "A" and "B" of the illustrated PLC ladder and input/output timing diagrams, what statement is true?	The lamp will flash on then off for one cycle as long as the input contacts are closed.	The lamp will flash on then off for one cycle after a momentary closure of the input contacts, followed by a re-opening of the contacts.	The lamp will continue to flash on and off repeatedly after a momentary closure of the input contacts, followed by a re-opening of the contacts.	**The lamp will continue to flash on and off repeatedly as long as the input contacts are closed.**
387	As shown in figures "A" and "B" of the illustration which represent PLC ladder and input/output diagrams of an SR bistable latch function block, what statement is true?	To maintain an energized "Output", "Input 1" must remain closed.	**To maintain an energized "Output", "Input 1" need only be momentarily closed.**	To maintain an energized "Output", "Input 2" must remain closed.	To maintain an energized "Output", "Input 2" need only be momentarily closed.
388	As shown in figures "A" and "B" of the illustration which represent PLC ladder and input/output diagrams of an SR bistable latch function block, what statement is true?	To de-energize the "Output", "Input 1" must remain closed.	To de-energize the "Output", "Input 1" need only be momentarily closed.	To de-energize the "Output", "Input 2" must remain closed.	**To de-energize the "Output", "Input 2" need only be momentarily closed.**
389	As shown in figures "A" and "B" of the illustration, the potable water pump trips out on overload shortly after each start attempt. In an attempt to troubleshoot the problem, the following voltage readings are taken during the brief run period: At load side of disconnect: L1 to L2 is 230 VAC L2 to L3 is 230 VAC L3 to L1 is 230 VAC At load side of contactor: T1 to T2 is 105 VAC T2 to T3 is 106 VAC T3 to T1 is 229 VAC At load side of overloads: T1 to T2 is 100 VAC T2 to T3 is 101 VAC T3 to T1 is 223 VAC What is most likely the problem?	Disconnect switch contacts on line 2 are badly corroded.	**Main contactor contacts on line 2 are badly corroded.**	Thermal overload heater on line two connection badly corroded.	Partial open in phase winding in motor connected to line 2.

ID #	Question	Choice A	Choice B	Choice C	Choice D
390	As shown in figures "A" and "B" of the illustration, what happens when the "man-stop-auto" switch is placed in the "man" position?	**If the disconnect switch is closed, the potable water pump will start and run continuously regardless of the pressure.**	Even with the disconnect switch open, the potable water pump will start and run continuously regardless of the pressure.	If the disconnect switch is closed, the potable water pump will start and cycle on and off by the action of the pressure switch.	Even with the motor experiencing overloads, the potable water pump will start and run continuously without tripping out on overload.
391	As shown in figures "A" and "B" of the illustration, what is the functional purpose of the normally open auxiliary contacts of the main contactor?	They are wired in parallel with the start button contacts and provide low voltage protection.	They are wired in series with the pressure switch and provide low voltage release.	They connect the drive motor across the three phase line.	**In this particular application, these contacts are unused.**
392	As shown in figures "A" and "B" of the illustration, what statement is true?	Whether in the "hand" or "auto" mode, low voltage release is featured.	**Whether in the "hand" or "auto" mode, low voltage protection is featured.**	When in the "hand" mode, low voltage release is featured, but when in the "auto" mode, low voltage protection is featured.	When in the "hand" mode, low voltage protection is featured, but when in the "auto" mode, low voltage release is featured.
393	As shown in figures "A" and "B" of the illustration, what will be the result of placing the "hand-auto" selector switch in the "hand" position?	The compressor drive motor will immediately start even without pushing the start button.	The compressor drive motor will start after pushing the start button only if the pressure is relatively low.	**The compressor drive motor will start after pushing the start button regardless of the pressure.**	The compressor drive motor will jog briefly after pushing the start button.
394	As shown in figures "A", "B", "C" and "D" of the illustration pertaining to various diagrams specific to a PLC controlled temperature control system using a bimetallic thermostat, which statement is true?	**The bimetallic thermostat is a normally closed switch which opens on a temperature rise and closes on a temperature fall.**	The bimetallic thermostat is a normally open switch which closes on a temperature rise and opens on a temperature fall.	The bimetallic thermostat is a resistance that varies inversely with temperature.	The bimetallic thermostat is a resistance that varies directly with temperature.
395	As shown in figures "A", "B", "C" and "D" of the illustration pertaining to various diagrams specific to a PLC controlled temperature control system using a bimetallic thermostat, which statement is true?	The temperature sensing input device sensor delivers a digital, discrete signal voltage and the output device load receives an analog, variable output voltage.	The temperature sensing input device sensor delivers an analog, variable signal voltage and the output device load receives an analog, variable output voltage.	**The temperature sensing input device sensor delivers a digital, discrete signal voltage and the output device load receives a digital, discrete output voltage.**	The temperature sensing input device sensor delivers an analog, variable signal voltage and the output device load receives a digital, discrete output voltage. .

ID #	Question	Choice A	Choice B	Choice C	Choice D
396	As shown in figures "A", "B", "C", "D" and "E" of the illustration pertaining to various diagrams specific to a PLC controlled temperature control system using a thermistor and operational amplifier, which statement is true?	The temperature sensing input device sensor delivers a digital, discrete signal voltage and the output device load receives an analog, variable output voltage.	The temperature sensing input device sensor delivers an analog, variable signal voltage and the output device load receives an analog, variable output voltage.	The temperature sensing input device sensor delivers a digital, discrete signal voltage and the output device load receives a digital, discrete output voltage.	**The temperature sensing input device sensor delivers an analog, variable signal voltage and the output device load receives a digital, discrete output voltage. .**
397	As shown in figures "A", "B", "C", "D" and "E" of the illustration pertaining to various diagrams specific to a PLC controlled temperature control system using a thermistor and operational amplifier, which statement is true?	The thermistor is a normally closed switch which opens on a temperature rise and closes on a temperature fall.	The thermistor is a normally open switch which closes on a temperature rise and opens on a temperature fall.	**The thermistor is a resistance that varies inversely with temperature.**	The thermistor is a resistance that varies directly with temperature.
398	As shown in figures "A", "B", "C", and "D" of the illustrated PLC controlled heating system, in addition to the clock timer, run and stop contacts all being closed, what other input requirements must be met for the boiler to be firing?	The space air sensor, tank water sensor, and boiler water sensor contacts must ALL be closed.	The space air sensor contacts must be closed AND either the tank water sensor or the boiler water sensor contacts must be closed.	The tank water sensor contacts must be closed AND either the space air sensor or the boiler water sensor contacts must be closed.	**The boiler water sensor contacts must be closed AND either the space air sensor or tank water sensor contacts must be closed.**
399	As shown in figures "A", "B", "C", and "D" of the illustrated PLC controlled heating system, what input requirements must be met for the circulating pump #1 to be running?	**The space air sensor contacts must be closed and the boiler must be firing.**	The hot water tank sensor contacts must be closed and the boiler must be firing.	The space air sensor contacts must be closed and the boiler must be idle.	The hot water tank sensor contacts must be closed and the boiler must be idle.
400	As shown in figures "A", "B", "C", and "D" of the illustrated PLC controlled heating system, what input requirements must be met for the circulating pump #2 to be running?	The space air sensor contacts must be closed and the boiler must be firing.	**The hot water tank sensor contacts must be closed and the boiler must be firing.**	The space air sensor contacts must be closed and the boiler must be idle.	The hot water tank sensor contacts must be closed and the boiler must be idle.
401	As shown in figures "A", "B", "C", and "D" of the illustration, what is the usual means by which the rotation direction of the motor is reversed?	Interchanging leads L1 and L2	**Interchanging leads T5 and T8**	Interchanging leads T4 and T8	Interchanging leads T1 and T5
402	As shown in figures "A", "B", and "C" of the illustrated PLC controlled temperature control system featuring deadband, what statement is true?	The greater the deadband the more precise the control of temperature and the greater the frequency of switching on and off of the heater.	**The smaller the dead band the more precise the control of temperature and the greater the frequency of switching on and off of the heater.**	The greater the deadband the less precise the control of temperature and the greater the frequency of switching on and off of the heater.	The smaller the deadband the less precise the control of temperature and the greater the frequency of switching on and off of the heater.

ID #	Question	Choice A	Choice B	Choice C	Choice D
403	As shown in figures "A", "B", and "C" of the illustrated PLC controlled temperature control system featuring deadband, what statement is true?	The greater the deadband the more precise the control of temperature and the greater the frequency of switching on and off of the heater.	**The smaller the deadband the more precise the control of temperature and the greater the frequency of switching on and off of the heater.**	The greater the deadband the more precise the control of temperature and the lesser the frequency of switching on and off of the heater.	The smaller the deadband the more precise the control of temperature and the lesser the frequency of switching on and off of the heater.
404	As shown in figures "A", "B", and "C" of the illustration, if the negative DC signal voltage is more negative at the inverting input than at the non-inverting input, what will be the characteristic of the output?	the output voltage will be the actual difference between the input voltages and will be negative	the output voltage will be a greatly amplified difference between the input voltages and will be negative	the output voltage will be the actual difference between the input voltages and will be positive	**the output voltage will be a greatly amplified difference between the input voltages and will be positive**
405	As shown in figures "A", "B", and "C" of the illustration, what is an important characteristic of the differential amplifier segment of the operational amplifier?	it provides low input impedance	it provides low output impedance	**it provides high input impedance**	it provides high output impedance
406	As shown in figures "A", "B", and "C" of the illustration, what is the purpose of the differential amplifier segment of the 741 operational amplifier?	detect and amplify the voltage difference between the inputs at pins 1 and 5	**detect and amplify the voltage difference between the inputs at pins 2 and 3**	detect and amplify the voltage difference between the inputs at pins 1 and 2	detect and amplify the voltage difference between the inputs at pins 3 and 5
407	As shown in figures "A", "B", and "C" of the illustration, what is the purpose of the voltage amplifier segment of the 741 operational amplifier?	it further amplifies the voltage difference between the inverting input and the non-inverting input as amplified by the differential amplifier and produces a very low output impedance	it amplifies the voltage difference between the positive and negative power supplies	it further amplifies the voltage difference between the inverting input and the non-inverting input as amplified by the differential amplifier and produces a very low gain	**it further amplifies the voltage difference between the inverting input and the non-inverting input as amplified by the differential amplifier and produces a very high gain**
408	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is test a diode using the diode test function? Note: this function requires toggling with the secondary function pushbutton.	switch position "4" and terminal jacks "3 and 4"	**switch position "5" and terminal jacks "3 and 4"**	switch position "4" and terminal jacks "1 and 4"	switch position "5" and terminal jacks "1 and 3"

ID #	Question	Choice A	Choice B	Choice C	Choice D
409	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure AC currents anticipated as high as 5 amps?	switch position "6" and terminal jacks "1 and 4"	**switch position "7" and terminal jacks "2 and 4"**	switch position "1" and terminal jacks "1 and 4"	switch position "7" and terminal jacks "1 and 2"
410	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure AC frequency?.	switch position "6" and terminal jacks "3 and 4"	switch position "7" and terminal jacks "3 and 4"	switch position "1" and terminal jacks "1 and 4"	**switch position "1" and terminal jacks "3 and 4"**
411	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure AC voltage?	**switch position "1" and terminal jacks "3 and 4"**	switch position "2" and terminal jacks "3 and 4"	switch position "1" and terminal jacks "2 and 3"	switch position "2" and terminal jacks "2 and 3"
412	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure DC currents anticipated as high as 200 milliamps?	switch position "6" and terminal jacks "2 and 4"	switch position "7" and terminal jacks "1 and 4"	**switch position "6" and terminal jacks "1 and 4"**	switch position "7" and terminal jacks "2 and 4"
413	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure DC voltages no higher than 600 millivolts.	switch position "2" and terminal jacks "1 and 3"	switch position "3" and terminal jacks "1 and 3"	switch position "2" and terminal jacks "3 and 4"	**switch position "3" and terminal jacks "3 and 4"**
414	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure DC volts not to exceed 1000 VDC?	switch position "2" and terminal jacks "2 and 3"	**switch position "2" and terminal jacks "3 and 4"**	switch position "3" and terminal jacks "2 ands 3"	switch position "3" and terminal jacks "3 and 4"
415	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure resistance?	switch position "5" and terminal jacks "3 and 4"	switch position "4" and terminal jacks "1 and 3"	switch position "5" and terminal jacks "1 and 3"	**switch position "4" and terminal jacks "3 and 4"**
416	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to perform an audible continuity test?	switch position "4" and terminal jacks "3 and 4"	switch position "4" and terminal jacks "1 and 3"	switch position "5" and terminal jacks "1 and 3"	**switch position "5" and terminal jacks "3 and 4"**
417	As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to test a capacitor using the capacitance test function? Note: this function requires toggling with the secondary function pushbutton.	**switch position "4" and terminal jacks "3 and 4"**	switch position "5" and terminal jacks "3 and 4"	switch position "4" and terminal jacks "1 and 3"	switch position "5" and terminal jacks "1 and 3"

ID #	Question	Choice A	Choice B	Choice C	Choice D
418	As shown in figures "C" , "D", and "E" of the illustrated PLC ladder and input/output timing diagrams, the application of the on-delay timer is used to produce what effect?	on-delay	off-delay	on-off cycle	**pulse**
419	As shown in figures "C" and "D" of the illustration which represent PLC ladder and input/output diagrams of an RS bistable latch function block, what statement is true?	To de-energize the "Output", "Input 1" must remain closed.	**To de-energize the "Output", "Input 1" need only be momentarily closed.**	To de-energize the "Output", "Input 2" must remain closed.	To de-energize the "Output", "Input 2" need only be momentarily closed.
420	As shown in figures "C" and "D" of the illustration which represent PLC ladder and input/output diagrams of an RS bistable latch function block, what statement is true?	To maintain an energized "Output", "Input 1" must remain closed.	To maintain an energized "Output", "Input 1" need only be momentarily closed.	To maintain an energized "Output", "Input 2" must remain closed.	**To maintain an energized "Output", "Input 2" need only be momentarily closed.**
421	As shown in figures "E" and "F" of the pictured high voltage rack mounted circuit breaker, what figure represents the circuit breaker position when in the open or tripped position?	A	B	**C**	D
422	As shown in figures "E" and "F" of the pictured high voltage rack mounted circuit breaker, what figure represents the circuit breaker position when in the test position for testing the various shunt trips?	A	**B**	C	D
423	As shown in in figure "B" of the illustrated typical ground fault relay, what statement concerning the leakage current setting adjustment is true?	**Setting the leakage current for too low a value may increase the likelihood of nuisance trips and setting the leakage current for too high a value may result in incidental damage due to a ground fault.**	Setting the leakage current for too high a value may increase the likelihood of nuisance trips and setting the leakage current for too low a value may result in incidental damage due to a ground fault.	Setting the leakage current for too high or too low a value may increase the likelihood of nuisance trips.	Setting the leakage current for too high or too low a value may result in incidental damage due to a ground fault.

ID #	Question	Choice A	Choice B	Choice C	Choice D
424	As shown in in figure "C" of the illustrated typical ground fault sensor, what statement concerning its installation is true?	Any one of the motor feeder conductors is passed through the window and a connection is made between the ground fault relay sensor terminals and the two wire terminals in the upper right hand corner of the sensor as shown in the illustration.	**All three of the motor feeder conductors are passed through the window and a connection is made between the ground fault relay sensor terminals and the two wire terminals in the upper right hand corner of the sensor as shown in the illustration.**	Any two of the motor feeder conductors are passed through the window and a connection is made between the ground fault relay sensor terminals and the two wire terminals in the upper right hand corner of the sensor as shown in the illustration.	Any two of the motor feeder conductors are connected to the two wire terminals in the upper right hand corner of the sensor as shown in the illustration and the ground fault relay sensor lead connections are passed through the window.
425	As shown in the battery circuit illustration, what would be the nominal output voltage and capacity of the battery bank if the batteries individually were 12 VDC lead-acid batteries rated at 100 ampere-hours each?	12 volts, 100 ampere-hours	12 volts, 400 ampere-hours	**48 volts, 100 ampere-hours**	48 volts, 400 ampere-hours
426	As shown in the battery circuit illustration, what would be the nominal output voltage of the battery bank if the batteries individually were 12 VDC lead-acid batteries?	12 volts	24 volts	36 volts	**48 volts**
427	As shown in the cutaway view of the lead acid battery in figure "A" of the illustration, if one half of the battery's cells are revealed by the cutaway section (with the other half remaining hidden from view), what is the nominal output voltage of the battery?	6 volts	7.5 volts	**12 volts**	18 volts
428	As shown in the figures "A" and "B" of the illustrated RS-232 Synchronous Serial DB-25 connector, what pin is used as the common signal return path pin during serial communications?	pin 1	pin 2	pin 3	**pin 7**
429	As shown in the figures "A" and "B" of the illustrated RS-232 Synchronous Serial DB-25 connector, what pin is used as the input data pin during serial communications?	pin 2	**pin 3**	pin 11	pin 17
430	As shown in the figures "A" and "B" of the illustrated RS-232 Synchronous Serial DB-25 connector, what pin is used as the output data pin during serial communications?	**pin 2**	pin 3	pin 15	pin 24

ID #	Question	Choice A	Choice B	Choice C	Choice D
431	As shown in the figures "A" and "C" of the illustration, two PLC ladder diagrams are presented that are used for timer controlled on/off cycling using on-delay timers. The timing diagram illustrated in figure "B" is associated with which ladder diagram?	A only	C only	**A and C**	Neither A nor C
432	As shown in the illustrated 3 phase synchronous motor controller, what statement is true regarding motor start-up?	DC is applied to the motor field at the instant of start-up and the resulting field current is used to accelerate the motor up to speed	the motor is started at reduced voltage using primary reactors	**the motor is started as an induction motor using amortisseur windings in the rotor**	the motor is started at reduced voltage using primary resistors
433	As shown in the illustrated 3 phase synchronous motor controller, what statement is true regarding operation at synchronous speed?	**as the motor approaches synchronous speed the voltage induced across the rotor winding decays in amplitude and frequency causing the polarized frequency relay to drop out which energizes the field contactor, thus connecting the DC field across the field winding**	as the motor approaches synchronous speed the voltage induced across the rotor winding increases in amplitude and frequency causing the polarized frequency relay to pick up which de-energizes the field contactor, thus disconnecting the DC field across the field winding	as the motor approaches synchronous speed the voltage induced across the rotor winding decays in amplitude and frequency causing the polarized frequency relay to pick up which de-energizes the field contactor, thus disconnecting the DC field across the field winding	as the motor approaches synchronous speed the voltage induced across the rotor winding increases in amplitude and frequency causing the polarized frequency relay to drop out which energizes the field contactor, thus connecting the DC field across the field winding
434	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M1" is electrically interlocked with what other contactors?	M2, M3, and M4	M2, M5, and M6	**M2, M3, and M5**	M2, M4, and M6
435	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M2" is electrically interlocked with what other contactors?	M1, M3, and M4	**M1, M3, and M5**	M1, M5, and M6	M1, M4, and M6
436	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M3" is electrically interlocked with what other contactors?	M5, M1, and M4	M5, M4, and M2	M5, M1, and M6	**M5, M2, and M1**
437	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M4" is electrically interlocked with what other contactors?	M5, M1, and M3	M5, M3, and M2	M5, M2, and M6	**M5, M2, and M1**
438	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M5" is electrically interlocked with what other contactors?	M3, M1, and M4	**M3, M2, and M1**	M3, M2, and M6	M3, M6, and M5

ID #	Question	Choice A	Choice B	Choice C	Choice D
439	As shown in the illustrated 4-speed, 3-phase motor controller, contactor "M6" is electrically interlocked with what other contactors?	M3, M1, and M4	**M3, M2, and M1**	M3, M2, and M4	M3, M6, and M5
440	As shown in the illustrated 4-speed, 3-phase motor controller, what contactors are mechanically interlocked?	**M2 and M5**	M2 and M1	M3 and M4	M5 and M6
441	As shown in the illustrated 4-speed, 3-phase motor controller, what contactors are mechanically interlocked?	M1 and M2	**M1 and M3**	M3 and M4	M5 and M6
442	As shown in the illustrated adaptive digital steering control system functional block diagram and listed system interface signals table, what would the rudder order signal output voltage to the rudder servo amplifier be for a rudder order of 15 degrees right rudder, assuming left rudder signals are negative and right rudder signals are positive in polarity.	-1.33 VDC	-3.75 VDC	**+3.75 VDC**	+5.0 VDC
443	As shown in the illustrated adaptive digital steering control system functional block diagram and listed system interface signals table, what would the rudder order signal output voltage to the rudder servo amplifier be for a rudder order of 20 degrees left rudder, assuming left rudder signals are negative and right rudder signals are positive in polarity.	-2.25 VDC	-4.0 VDC	**-5.0 VDC**	+5.0 VDC
444	As shown in the illustrated alternator protection scheme diagram, what device provides input to the reverse power relay "RP", the undervoltage/overvoltage relay "UV/OV", and the underfrequency/overfrequency relay "UF/OF"?	current transformer	**potential transformer**	thermal monitor sensors	strobe sensors
445	As shown in the illustrated alternator protection scheme diagram, what device provides the input to the overcurrent inverse time relay "OCIT", the overcurrent instantaneous trip "OC (inst.)", and the negative phase sequence relay "NPS"?	**current transformer**	potential transformer	thermal monitor sensors	infrared sensors
446	As shown in the illustrated alternator protection scheme diagram, what function does the negative phase sequence relay (NPS) perform?	trips the alternator circuit breaker due to extremely high overcurrent caused by a short-circuit fault	trips the alternator circuit breaker due to sustained motor overload current where the trip delay is directly proportional to the overload current	trips the alternator circuit breaker due to sustained motor overload current where the trip delay is inversely proportional to the overload current	**trips the alternator circuit breaker in the event of unbalanced stator currents**

ID #	Question	Choice A	Choice B	Choice C	Choice D
447	As shown in the illustrated alternator protection scheme diagram, what function does the overcurrent (inst.) trip perform?	**trips the alternator circuit breaker due to extremely high overcurrent caused by a short-circuit fault**	trips the alternator circuit breaker due to sustained motor overload current where the trip delay is directly proportional to the overload current	trips the alternator circuit breaker due to sustained motor overload current where the trip delay is inversely proportional to the overload current	trips the alternator circuit breaker in the event of unbalanced stator currents
448	As shown in the illustrated alternator protection scheme diagram, what function does the overcurrent inverse time relay "OCIT" perform?	trips the alternator circuit breaker due to extremely high overcurrent caused by a short-circuit fault	trips the alternator circuit breaker due to sustained motor overload current where the trip delay is directly proportional to the overload current	**trips the alternator circuit breaker due to sustained motor overload current where the trip delay is inversely proportional to the overload current**	trips the alternator circuit breaker in the event of unbalanced stator currents
449	As shown in the illustrated alternator protection scheme diagram, what function does the reverse power relay (RP) perform?	trips the alternator circuit breaker when the alternator phase sequence is opposite that of the bus	trips the alternator circuit breaker when the alternator main field polarity is reversed	**trips the alternator circuit breaker when the alternator begins to motorize**	trips the alternator circuit breaker when the alternator prime mover is being driven in the reverse direction
450	As shown in the illustrated alternator protection scheme diagram, under what circumstances would an earth leakage relay (EL) be used?	in ungrounded low voltage systems	in grounded low voltage systems	in high voltage systems with a low impedance earthing resistor or transformer	**in high voltage systems with a high impedance earthing resistor or transformer**
451	As shown in the illustrated alternator protection scheme diagram, what would cause the differential relay (DIFF) to trip the alternator circuit breaker?	a difference of voltage between each end of a stator phase winding	a difference in voltage between each end of the main field winding	**a difference in current between each end of a stator phase winding**	a difference in current between each end of the main field winding
452	As shown in the illustrated block diagram for a digitized echo sounding system, what statement is true concerning the function of the transducer?	The transducer converts radio frequency (RF) electromagnetic energy to acoustic energy while receiving and converts the reflected acoustic energy back into RF electromagnetic energy while transmitting.	**The transducer converts radio frequency (RF) electromagnetic energy to acoustic energy while transmitting and converts the reflected acoustic energy back into RF electromagnetic energy while receiving.**	The transducer converts audio frequency (AF) electromagnetic energy to acoustic energy while receiving and converts the reflected acoustic energy back into AF electromagnetic energy while transmitting.	The transducer converts audio frequency (AF) electromagnetic energy to acoustic energy while transmitting and converts the reflected acoustic energy back into AF electromagnetic energy while receiving.

ID #	Question	Choice A	Choice B	Choice C	Choice D
453	As shown in the illustrated block diagram for a digitized echo sounding system, what statement is true concerning the transmission and reception of acoustical energy?	The acoustical energy is produced as a continuous wave and transmitted from one transducer and the reflected acoustical energy is received by a second transducer.	The acoustical energy is produced as a continuous wave and transmitted from the transducer and the reflected acoustical energy is received by the same transducer.	The acoustical energy is produced as rapid, short high intensity pulses and transmitted from one transducer and the reflected acoustical energy is received by a second transducer.	**The acoustical energy is produced as rapid, short high intensity pulses and transmitted from the transducer and the reflected acoustical energy is received by the same transducer.**
454	As shown in the illustrated block diagram for a distributed automation system, what statement is true concerning the area networks?	The LAN is a single non-redundant network and the partioned CAN is a dual redundant network, with no interconnectivity between the two networks.	The LAN is a dual redundant network and the partioned CAN is also a dual redundant network, with no interconnectivity between the two networks.	**The LAN is a dual redundant network and the partitioned CAN is also a dual redundant network, with both networks being interconnected.**	The LAN is a single non-redundant network and the partitioned CAN is a dual redundant network, with both networks being interconnected.
455	As shown in the illustrated block diagram for a distributed automation system, what statement is true concerning the data communication pathways labeled "Dual CAN"?	These are control area networks providing supply and return pathways for communication.	These are communication access nodes providing supply and return pathways for communication.	**These are control area networks providing redundancy so as to maintain communications despite a bus failure.**	These are communication access nodes providing redundancy so as to maintain communications despite a node failure.
456	As shown in the illustrated block diagram for a distributed automation system, what statement is true concerning the units labeled "ROS" which are remote operating system workstations?	The ROS located in the ship's office is designated as the master ROS.	The ROS located in the wheelhouse is designated as the master ROS.	Operator access to control functions among the various ROS locations are all identical.	**Operator access to control functions among the various ROS locations differ depending system configuration and need.**
457	As shown in the illustrated block diagram for a distributed automation system, what statement is true concerning the units labeled "WCU" in the accommodations?	**These are watch cabin units extending the alarm system to engineer staterooms on vessels with periodically unmanned engine rooms.**	These are watch control units extending remote operating system functionality to engineer staterooms on vessels with periodically unmanned engine rooms.	These are watch cabin units extending the alarm system to engineer staterooms on vessels with engine rooms requiring 24-hour manning of watches.	These are watch control units extending remote operating system functionality to engineer staterooms on vessels with engine rooms requiring 24-hour manning of watches.

ID #	Question	Choice A	Choice B	Choice C	Choice D
458	As shown in the illustrated block diagram for a distributed automation system, what statement is true concerning the workstations labeled "LOS" associated with the port power management system?	These are local operating system workstations that allow local control of processes related to the operation and control of all functions within the engineering plant.	**These are local operating system workstations that allow local control of processes related to the operation and control of the port generator.**	These are lube oil system workstations that allow local control of processes related to the lubrication of the port generators.	These are lube oil system workstations that allow local control of processes related to the lubrication of all machinery within the engineering plant.
459	As shown in the illustrated block diagram for a programmable logic controller system, in what functional component is the program developed and used to transfer the program to the memory unit of the PLC?	communications interface	program and data memory	processor	**programming device**
460	As shown in the illustrated block diagram for a programmable logic controller system, what functional component is used to convert the mains AC supply voltage to a low voltage DC?	input interface	processor	**power supply**	output interface
461	As shown in the illustrated block diagram for a programmable logic controller system, what functional component is used to convey signals from switches, counters, and various sensors to the processor?	**input interface**	processor	power supply	output interface
462	As shown in the illustrated block diagram for a programmable logic controller system, what functional component is used to convey signals from the processor to motor starter coils, valve solenoids, and other such devices?	input interface	processor	power supply	**output interface**
463	As shown in the illustrated block diagram for a programmable logic controller system, what functional component is used to interpret inputs, carry out program instructions, and communicate decisions as action signals to outputs?	communications interface	**processor**	input interface	output interface
464	As shown in the illustrated block diagram for a programmable logic controller system, what functional component is used to receive and transmit data to and from other PLCs on the network?	**communications interface**	program and data memory	input interface	output interface
465	As shown in the illustrated block diagram for an automatic radio direction finder, what statement is true concerning the mechanical linkage of the servo-motor?	The servo-motor stator is linked to both the goniometer search coil and the relative bearing pointer shaft.	**The servo-motor rotor is linked to both the goniometer search coil and the relative bearing pointer shaft.**	The servo-motor rotor is linked to the relative bearing pointer shaft only.	The servo-motor rotor is linked to the goniometer search coil only.

ID #	Question	Choice A	Choice B	Choice C	Choice D
466	As shown in the illustrated block diagram for an automatic radio direction finder, what will happen when the control signal amplifier output goes to zero null?	**The servo-motor rotor will stop.**	The servo-motor rotor will increase in speed.	The servo-motor rotor will reverse direction.	The servo-motor rotor will oscillate back and forth in changing direction of rotation.
467	As shown in the illustrated block, ladder, and input/output diagrams, what type of functional logic circuit is represented?	NOT gate	AND Gate	OR Gate	**XOR gate**
468	As shown in the illustrated block, ladder, and input/output diagrams, what type of logic circuit is represented?	AND gate	**NAND gate**	OR gate	NOR gate
469	As shown in the illustrated block, ladder, and input/output diagrams, what type of logic circuit is represented?	AND gate	NAND gate	OR gate	**NOR gate**
470	As shown in the illustrated circuit, ladder, and input/output diagrams, what type of logic circuit is represented?	NAND gate	NOR gate	**NOT gate**	OR gate
471	As shown in the illustrated combination starter, what statement is true?	**The motor control station is of the momentary contact pushbutton type set up for low voltage protection.**	The motor control station is of the momentary contact pushbutton type set up for low voltage release.	The motor control station is of the maintained contact selector type set up for low voltage protection.	The motor control station is of the maintained contact selector type set up for low voltage release.
472	As shown in the illustrated combination starter, what statement is true?	The primary function of the circuit breaker is for motor overload protection, as well as a means of disconnect.	The control circuit operating voltage is the same as the motor operating voltage.	**The control circuit operating voltage is lower than the motor operating voltage.**	The motor overload relay resets automatically upon overload.
473	As shown in the illustrated combination starter, what statement is true?	The primary function of the circuit breaker is for motor overload protection, as well as a means of disconnect.	The control circuit operating voltage is the same as the motor operating voltage.	**The motor overload relay must be manually reset upon overload.**	The motor overload relay resets automatically upon overload.
474	As shown in the illustrated DC machine which is configured as a generator, what is the polarity of the interpoles as compared to the main field poles?	**in the direction of rotation, the preceding interpole should have the same polarity as the following main pole**	in the direction of rotation, the preceding interpole should have the opposite polarity as the following main pole	in the direction of rotation, the following interpole should have the same polarity as the preceding main pole	the polarities of the interpoles 180 degrees opposite one another should be the same, the actual polarities compared to that of the main poles does not matter

ID #	Question	Choice A	Choice B	Choice C	Choice D
475	As shown in the illustrated DC machine which is configured as a generator, what is the purpose of the interpoles?	strengthen the main field above and beyond the capability of the main field poles	**counteract armature reaction to maintain the brushes in the neutral plane to minimize brush sparking**	provide residual magnetism to facilitate an output by means of self-excitation	statically balance the stator for uniform weight distribution
476	As shown in the illustrated DC machine which is configured as a generator, what type of machine is illustrated in terms of the configuration of the windings?	series wound	differentially compound wound	cumulatively compound wound	**shunt wound**
477	As shown in the illustrated devices and symbols, which of the devices represents a time delay relay?	A	B	**C**	D
478	As shown in the illustrated devices and symbols, which of the devices represents an enclosed relay which is designed to plug into a pin base?	A	B	C	**D**
479	As shown in the illustrated devices and symbols, which of the devices represents an open general purpose relay?	**A**	B	C	D
480	As shown in the illustrated devices and symbols, which of the symbols represents a normally closed, timed open time delay relay contact?	E	F	**I**	K
481	As shown in the illustrated devices and symbols, which of the symbols represents a normally open, timed closed time delay relay contact?	**H**	I	J	K
482	As shown in the illustrated devices and symbols, which of the symbols represents a normally open, timed open time delay relay contact?	H	I	**J**	K
483	As shown in the illustrated devices and symbols, which of the symbols represents a normally closed, timed closed time delay relay contact?	H	I	J	**K**
484	As shown in the illustrated devices and symbols, which of the symbols represents a standard normally closed relay contact?	E	**F**	I	K
485	As shown in the illustrated devices and symbols, which of the symbols represents a standard normally open relay contact?	**E**	F	H	J

ID #	Question	Choice A	Choice B	Choice C	Choice D
486	As shown in the illustrated diagnostic setup checking for a reversed field pole on a ten-pole synchronous motor, if a rotor is being checked after reassembly and the steel bolts attract each other as shown in the illustration, what condition is indicated?	Either coil 3 or coil 4 has a reversed polarity	**Both coils 3 and coil 4 have the correct polarity**	An undetermined coil has reversed polarity	All coils have the correct polarity
487	As shown in the illustrated diagnostic setup checking for a reversed field pole on a ten-pole synchronous motor, if a rotor is being checked after reassembly and the steel bolts repel each other as shown in the illustration, what condition is indicated?	**Either coil 3 or coil 4 has a reversed polarity**	Both coils 3 and coil 4 have the correct polarity	An undetermined coil has reversed polarity	All coils have the correct polarity
488	As shown in the illustrated diagnostic setup for locating a shorted field coil of a ten-pole salient pole alternator, if 240 VAC 60-Hz is applied across the brushes, what would be the voltage drop across field coil #4 if that field coil had shorted turns and the other field coils were free of shorts?	**17 VAC**	24 VAC	25 VAC	32 VAC
489	As shown in the illustrated diagnostic setup for locating a shorted field coil of a ten-pole synchronous motor, if 240 VAC 60-Hz is applied across the brushes, what would be the individual voltage drops measured across each field coil assuming that none of the field coils are shorted?	6 VAC	12 VAC	**24 VAC**	48 VAC
490	As shown in the illustrated diagnostic setup for locating an open field coil of a ten-pole salient pole alternator, if 240 VDC is applied across the brushes, what statement is true of one of the field coils is open-circuited?	The voltage across the collector ring and any point before the open will be line voltage and the voltage across the collector ring and any point after the open will be zero voltage.	**The voltage across the collector ring and any point before the open will be zero voltage and the voltage across the collector ring and any point after the open will be line voltage.**	The voltage across the collector ring and any point before or after the open will be line voltage.	The voltage across the collector ring and any point before or after the open will be zero voltage.

ID #	Question	Choice A	Choice B	Choice C	Choice D
491	As shown in the illustrated diagnostic setup for locating an open field coil of a ten-pole synchronous motor, if 240 VDC is applied across the brushes, what statement is true if one of the field coils is open-circuited?	The voltage across the collector ring and any point before the open will be line voltage and the voltage across the collector ring and any point after the open will be zero voltage.	**The voltage across the collector ring and any point before the open will be zero voltage and the voltage across the collector ring and any point after the open will be line voltage.**	The voltage across the collector ring and any point before or after the open will be line voltage.	The voltage across the collector ring and any point before or after the open will be zero voltage.
492	As shown in the illustrated digital gyrocompass functional block diagram and the associated communication protocols table, what would the rate of turn signal voltage be if the rate of turn is 30 degrees per minute to port, assuming that rate of turn to port is negative and rate of turn to starboard is positive in polarity?	-0.5 VDC	-1.0 VDC	**-1.5 VDC**	+1.5 VDC
493	As shown in the illustrated echo sounding display unit and control panel and pertinent operating characteristic tables, what situation would require increasing the unit gain?	transitioning from a soft mud sea bed to mud/sand seabed	transitioning from a sand/mud seabed to a sand seabed	transitioning from a sand sea bed to stone/rock sea bed	**transitioning from a stone/rock sea bed to a sand seabed**
494	As shown in the illustrated effect of intermittent grounds on distributive capacitance, what event is illustrated in figure "A"?	**the effect of first contact of an intermittent ground**	the effect of breaking contact after the first contact of an intermittent ground	the effect of second contact of an intermittent ground	the effect of breaking contact after the second contact of an intermittent ground
495	As shown in the illustrated effect of intermittent grounds on distributive capacitance, what event is illustrated in figure "B"?	the effect of first contact of an intermittent ground	**the effect of breaking contact after the first contact of an intermittent ground**	the effect of second contact of an intermittent ground	the effect of breaking contact after the second contact of an intermittent ground
496	As shown in the illustrated effect of intermittent grounds on distributive capacitance, what event is illustrated in figure "C"?	the effect of first contact of an intermittent ground	the effect of breaking contact after the first contact of an intermittent ground	**the effect of second contact of an intermittent ground**	the effect of breaking contact after the second contact of an intermittent ground
497	As shown in the illustrated effect of intermittent grounds on distributive capacitance, what event is illustrated in figure "D"?	the effect of first contact of an intermittent ground	the effect of breaking contact after the first contact of an intermittent ground	the effect of second contact of an intermittent ground	**the effect of breaking contact after the second contact of an intermittent ground**

ID #	Question	Choice A	Choice B	Choice C	Choice D
498	As shown in the illustrated electric propulsion control scheme for a twin screw vessel, when the two shaft speeds are within 5% of each other, the bridge may select "shaft synchro-phasing mode". What statement is true regarding the purpose of this operating mode?	The respective shaft speed sensors alone are used to achieve identical shaft speeds without regard to propeller position to achieve even power development.	**The respective shaft speed and shaft position sensors are used to achieve identical shaft speeds and propeller synchronization to minimize shaft vibration.**	Vibration sensors are used to achieve identical shaft speeds and propeller synchronization to minimize vibration.	Cavitation sensors are used to achieve identical shaft speeds and propeller synchronization to minimize vibration.
499	As shown in the illustrated electrically operated watertight door controller, by what action are all the watertight doors automatically closed in an ordered sequence so as to not overload the emergency power supply?	depressing the individual remote closing switches for each door sequentially at the damage control station	depressing the individual local closing switches for each door sequentially at the near side of the watertight doors	depressing the individual local closing switches for each door sequentially at the far side of the watertight doors	**placing the reset-close master switch in the close position at the damage control station**
500	As shown in the illustrated electrically operated watertight door controller, by what action is the closing of the watertight door normally stopped when fully closed?	the motor will automatically stop when the motor trips out on overload	**the motor will automatically stop when the close limit switch de-energizes the close contactor coil**	the motor is stopped by briefly pushing the open pushbutton switch	the motor will automatically stop when the open limit switch briefly energizes the open contactor coil
501	As shown in the illustrated electrically operated watertight door controller, how is the rotation direction of the door motor reversed?	reversing the direct current direction through the motor series field and the motor armature	reversing the direct current direction through the motor series field and maintaining the same direct current direction through the motor armature.	**reversing the direct current direction through the motor armature and maintaining the same direct current direction through the motor series field**	reversing the direct current direction through the motor armature and maintaining the same direct current direction through the motor shunt field.
502	As shown in the illustrated electrically operated watertight door controller, what type of motor is used to open and close the watertight door?	Shunt wound DC motor	**Series wound DC motor**	Compound wound DC motor	Permanent magnet DC motor
503	As shown in the illustrated electronic overload relay circuit, what is the functional purpose of potentiometer "R2"?	**it is used to set the overcurrent trip setting of the overload relay**	it is used to set the instantaneous trip setting of the overload relay	it is used to set the inverse-time function setting of the overload relay	it is used to protect the rectifier from thermal damage
504	As shown in the illustrated electronic overload relay circuit, what is the functional purpose of potentiometer "R4"?	it is used to set the overcurrent trip setting of the overload relay	**it is used to set the instantaneous trip setting of the overload relay**	it is used to set the inverse-time function setting of the overload relay	it is used to protect the preamplifier from overcurrent

ID #	Question	Choice A	Choice B	Choice C	Choice D
505	As shown in the illustrated electronic overload relay circuit, what is the functional purpose of potentiometer "R6"?	it is used to set the overcurrent trip setting of the overload relay	it is used to set the instantaneous trip setting of the overload relay	**it is used to set the inverse-time function setting of the overload relay**	it is used to protect the preamplifier from overcurrent
506	As shown in the illustrated electronic overload relay, if it is desired to connect the relay to a trip indicator for alarm purposes, what terminals would the trip alarm be associated with in completing the series circuit?	95 and 96	96 and A3+	A4- and 97	**97 and 98**
507	As shown in the illustrated electronic overload relay, if it is desired to connect the relay to the operating coil for tripping purposes, what terminals would the operating coil be associated with in completing the series circuit?	**95 and 96**	96 and A3+	A4- and 97	97 and 98
508	As shown in the illustrated electronic overload relay, if the external current transformers transform current on a basis of 100:1, what is the actual full load current setting as presently set?	.45 amps	4.5 amps	45 amps	**450 amps**
509	As shown in the illustrated electronic overload relay, if the full load amp setting accurately represents the motor full load current of 10 amps and the trip class dip switch settings are for a trip class of 10, what statement is true assuming that the locked rotor current is 6 times the full load current.	The relay will trip in 10 seconds or less at a current equal to 100 amps.	The relay will trip in 60 seconds or less at a current equal to 10 amps.	**The relay will trip in 10 seconds or less at a current equal to 60 amps.**	They relay will trip in 60 seconds or less at a current equal to 100 amps.
510	As shown in the illustrated electronic overload relay, if the full load amp setting accurately represents the motor full load current of 4.5 amps and the definite time (D-time) setting is 25 sec. as shown, what statement is true assuming that the locked rotor current is 6 times the full load current.	The relay will trip in 25 seconds or less at a current equal to 4.5 amps.	The relay will trip in 6 seconds or less at a current equal to 112.5 amps.	The relay will trip in 6 seconds or less at a current equal to 27 amps.	**They relay will trip in 25 seconds or less at a current equal to 27 amps.**
511	As shown in the illustrated electronic overload relay, if the full load amp setting accurately represents the motor full load current of 6 amps and the trip class dip switch settings are for a trip class of 20, what statement is true assuming that the locked rotor current is 6 times the full load current.	**The relay will trip in 20 seconds or less at a current equal to 36 amps.**	The relay will trip in 36 seconds or less at a current equal to 120 amps.	The relay will trip in 20 seconds or less at a current equal to 6 amps.	They relay will trip in 36 seconds or less at a current equal to 20 amps.
512	As shown in the illustrated feeder disconnect controller, what statement is true?	the feeder disconnect contactor is electrically tripped	the feeder disconnect contactor is mechanically closed	**the feeder disconnect contactor remains closed on a loss of power**	the feeder disconnect contactor is electrically latched

ID #	Question	Choice A	Choice B	Choice C	Choice D
513	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "FS1"?	**It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.**	It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.	It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.	It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
514	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "FS2"?	It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.	**It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.**	It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.	It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
515	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "PS1"?	It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.	It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.	**It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.**	It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
516	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "PS2"?	It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.	It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.	It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.	**It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.**
517	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the status of the solenoid valves when the recovery unit is in the direct liquid recovery mode?	**SV1, closed** **SV2, closed** **SV3, open** **SV4, open**	SV1, closed SV2, open SV3, closed SV4, open	SV1, open SV2, open SV3, closed SV4, closed	SV1, open SV2, closed SV3, open SV4, closed
518	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the status of the solenoid valves when the recovery unit is in the direct vapor recovery mode?	SV1, closed SV2, closed SV3, open SV4, open	SV1, closed SV2, open SV3, closed SV4, open	**SV1, open** **SV2, open** **SV3, closed** **SV4, closed**	SV1, open SV2, closed SV3, open SV4, closed

ID #	Question	Choice A	Choice B	Choice C	Choice D
519	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, which of the labeled devices acts to automatically shut down the recovery unit compressor when the discharge pressure becomes too high?	FS1	FS2	PS1	**PS2**
520	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, which of the labeled devices acts to automatically shut down the recovery unit compressor when the recovery cylinder becomes 80% full?	**FS1**	FS2	PS1	PS2
521	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, which of the labeled devices acts to automatically shut down the recovery unit compressor when the refrigeration system reaches a depth of 15" Hg?	FS1	FS2	**PS1**	PS2
522	As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, which of the labeled devices acts to automatically transition the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode?	FS1	**FS2**	PS1	PS2
523	As shown in the illustrated graph showing the effect of overshoot on steering system control stability, what statement is true?	The deadband is approximately 20 degrees and the control system is inherently unstable.	The deadband is approximately 12 degrees and the control system is inherently unstable.	The deadband is approximately 8 degrees and the control system is inherently stable.	**The deadband is approximately 8 degrees and the control system is inherently unstable.**
524	As shown in the illustrated graph showing the operating principle of a phantom rudder, what statement is true?	The rudder phantom and rudder translator voltages are equal in magnitude and have the same polarity.	**The rudder phantom and rudder translator voltages are equal in magnitude and are opposite in polarity.**	The rudder phantom and rudder translator voltages are unequal in magnitude and have the same polarity.	The rudder phantom and rudder translator voltages are unequal in magnitude and are opposite in polarity.

ID #	Question	Choice A	Choice B	Choice C	Choice D
525	As shown in the illustrated graph showing the practical application of a phantom rudder, what statement is true?	The rudder phantom and rudder translator voltages are equal in magnitude and have the same polarity.	**The rudder phantom and rudder translator voltages are equal in magnitude and are opposite in polarity.**	The rudder phantom and rudder translator voltages are unequal in magnitude and have the same polarity.	The rudder phantom and rudder translator voltages are unequal in magnitude and are opposite in polarity.
526	As shown in the illustrated harmonic analysis diagram, which figure represents the fundamental (or first harmonic)?	A	**B**	C	D
527	As shown in the illustrated harmonic analysis diagram, which figure represents the seventh harmonic?	A	B	**C**	D
528	As shown in the illustrated harmonic analysis diagram, which figure represents the third harmonic?	**A**	B	C	D
529	As shown in the illustrated ladder diagram for a programmable logic controller used to control a motor, what statement is true?	Items "3", "4", "5", and "7" are output device loads	**Items "3", "6", and "8" are output device loads**	Items "1", "2", "6", and "8" are input device contacts	Items "2", "4", "5", and "7" are output device contacts
530	As shown in the illustrated LP centrifugal chiller high efficiency purge recovery unit piping schematic, what statement is true concerning the carbon filter tank?	**The carbon pellets within the carbon filter tank have an affinity for refrigerant vapor but not air and non-condensable gases.**	The carbon pellets within the carbon filter tank have an affinity for air and non-condensable gases but not refrigerant vapor.	The carbon pellets within the carbon filter tank have an affinity for both air and non-condensable gases and refrigerant vapor.	The carbon pellets within the carbon filter tank have neither an affinity for both air and non-condensable gases nor refrigerant vapor.
531	As shown in the illustrated LP centrifugal chiller high efficiency purge recovery unit piping schematic, what statement is true concerning the vacuum pump?	The vacuum pump is designed to remove air and non-condensable gases from the evaporator and transfer these gases to the carbon filter tank for eventual venting to the atmosphere.	**The vacuum pump is designed to remove refrigerant vapor from the carbon filter tank and transfer these vapors to the evaporator to minimize the loss of refrigerant to the atmosphere.**	The vacuum pump is designed to perform a dehydration evacuation on the system prior to charging with refrigerant.	The vacuum pump is designed to remove refrigerant vapor from the carbon filter tank and transfer these vapors to the purge chamber to blow the float valve clear.
532	As shown in the illustrated LP centrifugal chiller pressure maintenance system, under what operating conditions would the pressure maintenance system be operational?	testing for low-side leaks with the chiller in normal operation	when the chiller is operating under low heat load conditions	when the chiller is operating under high heat load conditions	**when the chiller is idle**
533	As shown in the illustrated LP centrifugal chiller pressure maintenance system, what is its functional purpose?	prevent surging	maintain a relatively low compression ratio under low heat load conditions	**prevent the entrance of air into the chiller when the chiller is idle**	prevent the entrance of air into the chiller under low heat load conditions

ID #	Question	Choice A	Choice B	Choice C	Choice D
534	As shown in the illustrated motor controller, assuming that the distribution system is an ungrounded system (common equipment grounding conductor insulated from the source), what faulty controller operation could be the result of the two accidental grounds as shown?	failure of the overload relay to trip the motor in the event of a motor overload	premature tripping of the motor on overload even though motor current draws are in the normal range	**inability to stop the motor by pushing the stop button**	controller exhibiting behavior appropriate to low voltage release rather than low voltage protection
535	As shown in the illustrated motor controller, assuming that the distribution system is an ungrounded system (common equipment grounding conductor insulated from the source), what faulty controller operation could be the result of the two accidental grounds as shown?	failure of the overload relay to trip the motor in the event of a motor overload	premature tripping of the motor on overload even though motor current draws are in the normal range	**mysterious startup of the motor without first depressing the start button**	controller exhibiting behavior appropriate to low voltage release rather than low voltage protection
536	As shown in the illustrated motor controller, what type of motor control logic is used?	**low voltage release and thermal overload protection**	low voltage release and magnetic overload protection	low voltage protection and thermal overload protection	low voltage protection and magnetic overload protection
537	As shown in the illustrated one-line diagram of a two-tiered emergency power system for a passenger ship, what statement is true?	On a restoration of normal ship's power, the final emergency loads power source is from the main switchboard, whereas the temporary emergency loads power source is battery (from AC/DC UPS "B").	**On a restoration of normal ship's power, the final and temporary emergency loads power source is from the main switchboard.**	On a restoration of normal ship's power, the final emergency loads power source is battery (from AC/DC UPS "B"), whereas the temporary emergency loads power source is from the main switchboard.	On a restoration of normal ship's power, the temporary emergency loads power source is battery (from AC/DC UPS "A"), whereas the final emergency loads power source is from the main switchboard.
538	As shown in the illustrated one-line diagram of a two-tiered emergency power system for a passenger ship, what statement is true?	On a loss of normal ship's power, the final emergency loads power source is battery (from AC/DC UPS "A"), whereas the temporary emergency loads power source is the emergency generator.	On a loss of normal ship's power, the temporary emergency loads power source is battery (from AC/DC UPS "A"), whereas the final emergency loads power source is the emergency generator.	On a loss of normal ship's power, the final emergency loads power source is battery (from AC/DC UPS "B"), whereas the temporary emergency loads power source is the emergency generator.	**On a loss of normal ship's power, the temporary emergency loads power source is battery (from AC/DC UPS "B"), whereas the final emergency loads power source is the emergency generator.**
539	As shown in the illustrated PLC ladder diagram and its associated input/output diagram, what type of logic is used?	output latching	output inverting	**output sequencing**	output latch resetting

ID #	Question	Choice A	Choice B	Choice C	Choice D
540	As shown in the illustrated plots of uncorrected and temperature corrected insulation resistance readings for a particular piece of equipment, at what point in time should the equipment have been refurbished or replaced?	2006	2008	2010	**no refurbishment or replacement was necessary through 2011**
541	As shown in the illustrated reduced voltage three phase squirrel cage induction motor controller, what is the functional purpose of the "CR" relay?	it is used to establish the time delay associated with initial startup in delta configuration and transitioning into wye configuration for run	**it is used to establish the time delay associated with initial startup in wye configuration and transitioning into delta configuration for run**	it is used to establish the actual length of time of closed transition when the motor is connected in both wye and delta configurations simultaneously	it is used to establish the actual length of time of open transition when the motor is briefly disconnected from line
542	As shown in the illustrated reduced voltage three phase squirrel cage induction motor controller, what is the functional purpose of the "M" contactor?	it connects the motor to line during the starting period only	it connects the motor to line during the starting and transition periods only	it connects the motor to line during the run period only	**it connects the motor to line during the starting period, transition period, and run period**
543	As shown in the illustrated reduced voltage three phase squirrel cage induction motor controller, what is the functional purpose of the "R" contactor?	it connects the motor in wye configuration during the run period only	**it connects the motor in delta configuration during the transition and run periods**	it connects the motor in wye configuration during the transition and run periods	it connects the motor in delta configuration during the transition period only
544	As shown in the illustrated reduced voltage three phase squirrel cage induction motor controller, what is the functional purpose of the "S1" contactor?	**it connects the motor in wye configuration during the start and transition periods**	it connects the motor in delta configuration during the start and transition periods	it connects the motor in wye configuration during the transition and run periods	it connects the motor in delta configuration during the transition and run periods
545	As shown in the illustrated reduced voltage three phase squirrel cage induction motor controller, what is the functional purpose of the "S2" contactor?	it allows the main and run contactors to be pulled in simultaneously during the run period	it prevents the main and run contactors to be pulled in simultaneously during the run period	**it allows the motor to be connected in wye and delta simultaneously during the closed transition period only**	it prevents the motor to be connected in wye and delta simultaneously during the open transition period only
546	As shown in the illustrated refrigeration system piping schematic diagram with the various accessories and controls and equipped with a conventional pump-down cycle, what does the temperature control thermostatic switch control?	the cycling open and closed of the thermostatic expansion valve	**the cycling open and closed of the liquid line solenoid valve**	the starting and stopping of the compressor drive motor	the starting and stopping of the evaporator fan motor

ID #	Question	Choice A	Choice B	Choice C	Choice D
547	As shown in the illustrated refrigeration system piping schematic diagram with the various accessories and controls and equipped with an air-cooled condenser with high side pressure controls, what statement is true concerning the fan cycling control pressure switch?	With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under high ambient temperature conditions.	**With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under low ambient temperature conditions.**	With a condenser fitted with multiple electric-motor driven fans, the number of fans in use would increase under low ambient temperature conditions.	With a condenser fitted with a single fan driven by a single-speed electric motor, the fan would cycle off under high ambient temperature conditions.
548	As shown in the illustrated solid-state stepless acceleration starting method graphs, which figure graphs a starting method that features a stepless acceleration ramp-up that is non-adjustable?	**A**	B	C	D
549	As shown in the illustrated solid-state stepless acceleration starting method graphs, which figure graphs a starting method that provides linear acceleration, but where the acceleration rate depends on the load and a tachometer input is not required?	A	B	**C**	D
550	As shown in the illustrated solid-state stepless acceleration starting method graphs, which figure graphs a starting method that provides the greatest control of starting current?	A	B	C	**D**
551	As shown in the illustrated solid-state stepless acceleration starting method graphs, which figure graphs a starting method that would require a tachometer input?	A	**B**	C	D
552	As shown in the illustrated steering hydraulic pump motor controller, what statement is true?	The pump motor is protected by low voltage protection and protected from motor overload by overload trip	The pump motor is protected by low voltage protection and protected from motor overload by visual warning	The pump motor is protected by low voltage release and protected from motor overload by overload trip	**The pump motor is protected by low voltage release and protected from motor overload by visual warning**
553	As shown in the illustrated steering hydraulic pump motor controller, what would be the result if one of the 10 amp fuses blew while the steering hydraulic pump motor was running	the steering hydraulic pump motor would stop running	the gyro-pilot unit motor would stop running	**the steering hydraulic pump motor run indicator light would go out**	nothing, except that the steering hydraulic pump motor overload indicator light would be unable to warn of an overload
554	As shown in the illustrated switchboard, what is the function of the switch labeled 'PFM Sel. Sw.'?	to determine bus frequency	to determine reactive volt amperes of the bus	to determine frequency of either generator	**to determine power factor of either generator**

ID #	Question	Choice A	Choice B	Choice C	Choice D
555	As shown in the illustrated synchroconverter for an AC synchronous propulsion motor, what statement is true concerning operational characteristics?	The controlled rectifier section of the converter controls motor speed and the controlled inverter section of the converter controls motor torque.	The controlled rectifier and controlled inverter sections of the converter both control motor torque only.	**The controlled rectifier section of the converter controls motor torque and the controlled inverter section of the converter controls motor speed.**	The controlled rectifier and controlled inverter sections of the converter both control motor speed only.
556	As shown in the illustrated three phase squirrel cage induction motor controller, what is the functional purpose of the "R" contactor?	**it connects the second part of the motor windings in wye configuration during the run period only**	it connects the second part of the motor winding is delta configuration during the run period only	it connects the first part of the motor windings in wye configuration during the start period only	it connects the first and second parts of the motor windings in wye configuration during the start and run periods
557	As shown in the illustrated three phase squirrel cage induction motor controller, what is the functional purpose of the "S" contactor?	it connects the motor to line during the starting period only	**it connects the motor to line during the starting and run periods**	it connects the motor in delta configuration during the starting period only	it connects the motor in wye configuration during the starting period only
558	As shown in the illustrated three phase squirrel cage induction motor controller, what starting method is used?	wye-delta starting	across-the-line starting	primary resistance starting	**part-winding starting**
559	As shown in the illustrated three phase squirrel cage induction motor controller, what type of reduced voltage starting is used?	delta-wye starter with an open transition	delta-wye starter with a closed transition	wye-delta starter with an open transition	**wye-delta starter with a closed transition**
560	As shown in the illustrated two speed motor controller, how is simultaneous energization of both contactors prevented?	electrical interlocking with the normally closed low speed and high speed contactor auxiliary contacts only	electrical interlocking with the normally closed low speed and high speed start pushbutton contacts only	mechanical interlocking with the low speed and high speed contactors only	**electrical interlocking with the normally closed low speed and high speed contactor auxiliary contacts and the normally closed low speed and high speed start pushbutton contacts**

ID #	Question	Choice A	Choice B	Choice C	Choice D
561	As shown in the illustrated two speed motor controller, what statement is true concerning the overload relays?	Both the low speed and high speed windings share common overload relay heaters and each of the overload relay contacts are both common to both the high and low speed contactor coils.	**Each of the low speed and high speed windings are protected by its own separately sized overload heaters and the each of the overload relay contacts are common to both the high and low speed contactor coils.**	The low speed and high speed windings share common overload relay heaters and each of the overload relay contacts is separately in series only with its respective contactor coil.	Each of the low speed and high speed windings are protected by its own separately sized overload heaters and each of the overload relay contact is separately in series only with its respective contactor coil.
562	As shown in the illustrated typical self-contained refrigerant recovery unit, what is the purpose of the discharge-side oil separator?	prevents contamination of the recovery unit compressor's lubricating oil with the disabled unit compressor's lubricating oil	prevents slugging of the recovery unit's compressor with liquid refrigerant	allows separation of oil from the recovered refrigerant so that an equal amount of new oil may be recharged when the unit is recharged with refrigerant	**prevents the loss of the recovery unit compressor's lubricating oil to the recovery cylinder**
563	As shown in the illustrated typical self-contained refrigerant recovery unit, what is the purpose of the pump-down solenoid valve and the restricted orifice?	preparation for transitioning from the direct liquid recovery mode to the direct vapor recovery mode	preparation for transitioning from the direct vapor recovery mode to the direct liquid recovery mode	**preparation for a recovery unit shutdown where the next job will be to recover a different type of refrigerant**	preparation for a normal recovery unit shutdown where the next job will be to recover the same type of refrigerant
564	As shown in the illustrated typical self-contained refrigerant recovery unit, what is the purpose of the suction-side oil separator?	prevents contamination of the recovery unit compressor's lubricating oil with the disabled unit compressor's lubricating oil	prevents slugging of the recovery unit's compressor with liquid refrigerant	allows separation of oil from the recovered refrigerant so that an equal amount of new oil may be recharged when the unit is recharged with refrigerant	**all the above**
565	As shown in the illustrated wiring diagram for an engine order telegraph system, what statement concerning the constant ringing and trouble alarm is true?	The constant ringing and trouble alarm sounds when there is a power loss from the battery or emergency switchboard as appropriate.	The constant ringing and trouble alarm sounds when there is a power loss from the 115 VAC power supply to the system.	**The constant ringing and trouble alarm sounds when the acknowledge handle and indicator arrow are not on the same order.**	The constant ringing and trouble alarm sounds when the transmitter rotor and corresponding indicator rotor are in correspondence.

ID #	Question	Choice A	Choice B	Choice C	Choice D
566	As shown in the illustrated wiring diagram for an engine order telegraph system, what statement concerning the current failure alarm buzzer is true?	The current failure alarm buzzer is energized when there is a power loss from the battery or emergency switchboard as appropriate.	**The current failure alarm buzzer is energized when there is a power loss from the 115 VAC power supply to the system.**	The current failure alarm buzzer is energized when there is a open stator winding in any transmitter or indicator in the system.	The current failure alarm buzzer is energized when there is an open rotor winding in any transmitter or indicator in the system.
567	As shown in the illustrated wiring diagram for an engine order telegraph system, what statement concerning the wrong direction alarm is true?	The wrong direction alarm sounds when the engine room indicator rotates in the opposite direction from the wheelhouse transmitter.	The wrong direction alarm sounds when the wheelhouse indicator rotates in the opposite direction from the engine room transmitter.	The wrong direction alarm sounds when the transfer relay fails to transfer transmitting and indicating function to the proper station.	**The wrong direction alarm sounds when the engine is started in the opposite direction from the engine room indicator pointer position.**
568	As shown in the illustrated wound-rotor induction motor, how is the direction of rotation of the motor reversed?	**Any two of the "T1, T2, and T3" leads are reversed only.**	Any two of the "M1, M2, and M3" leads are reversed only.	Any two of the "T1, T2, and T3" leads are reversed and any of the two "M1, M2, and M3" leads must be reversed as well.	It is not possible to change the direction of rotation of a wound rotor induction motor.
569	As shown in the illustrated wound-rotor induction motor, what statement is true concerning changing the motor speed?	To increase speed, the resistance of the external delta-connected rotor resistor bank must be decreased.	To increase speed, the resistance of the external delta-connected rotor resistor bank must be increased.	**To increase speed, the resistance of the external wye-connected rotor resistor bank must be decreased.**	To increase speed, the resistance of the external wye-connected rotor resistor bank must be increased.
570	As shown in the illustrated wound-rotor induction motor, what statement is true concerning motor lead connections?	The "T1, T2, and T3" motor leads are connected to the rotor windings via slip rings and brushes and the "M1, M2, and M3" motor leads are directly connected to the stator windings.	**The "M1, M2, and M3" motor leads are connected to the rotor windings via slip rings and brushes and the "T1, T2, and T3" motor leads are directly connected to the stator windings.**	The "T1, T2, and T3" motor leads are directly connected to the rotor windings and the "M1, M2, and M3" motor leads are connected to the stator windings via slip rings and brushes.	The "M1, M2, and M3" motor leads are directly connected to the rotor windings and the "T1, T2, and T3" motor leads are connected to the stator windings via slip rings and brushes.
571	As shown in the illustration of a DC diesel-electric propulsion drive system, what would be the set-up contactor configurations if #1 M/E is to be secured, so that only #2 M/E diesel-generator is set up to supply both propulsion motors?	**contactors G2 and S1 pulled in; contactors G1 and S2 dropped out**	contactors G2 and S1 dropped out; contactors G1 and S2 pulled in	contactors G2 and S2 pulled in; contactors G1 and S1 dropped out	contactors G2 and S2 dropped out; contactors G1 and S1 pulled in

ID #	Question	Choice A	Choice B	Choice C	Choice D
572	As shown in the illustration of a DC diesel-electric propulsion drive system, what would be the set-up contactor configurations if #2 M/E is to be secured, so that only #1 M/E diesel-generator is set up to supply both propulsion motors?	contactors G2 and S1 pulled in; contactors G1 and S2 dropped out	**contactors G2 and S1 dropped out; contactors G1 and S2 pulled in**	contactors G2 and S2 pulled in; contactors G1 and S1 dropped out	contactors G2 and S2 dropped out; contactors G1 and S1 pulled in
573	As shown in the illustration of a DC diesel-electric propulsion drive system, what would be the set-up contactor configurations if both #1and #2 M/E are to be secured, so that only the gas turbine generator is set up to supply both propulsion motors and the auxiliary diesel generator set up to supply the bow thruster motor?	contactors A1, A2, G1, and G2 pulled in; contactors S1 and S2 dropped out	contactors A1, S1, and S2 pulled in; contactors A2. G1, and G2 dropped out	**contactors A1, A2, S1, and S2 pulled in; contactors G1 and G2 dropped out**	contactors A1, A2, S1, and S2 dropped out; contactors G1 and G2 pulled in
574	As shown in the illustration of a turbo-electric propulsion drive system, in terms of motor speed and direction control, what statement is true?	the motor speed is controlled by varying voltage and frequency and the direction is controlled by reversing the polarity of the motor field	the motor speed is controlled by varying voltage, but keeping the frequency constant and the direction is controlled by phase sequence reversal	the motor speed is controlled by varying frequency, but keeping the voltage constant and the direction is controlled by phase sequence reversal	**the motor speed is controlled by varying voltage and frequency and the direction is controlled by phase sequence reversal**
575	As shown in the illustration of a turbo-electric propulsion drive system, in terms of the operating characteristics of the propulsion motor, what statement is true?	**the motor is started and accelerated as an induction motor, but runs as a synchronous motor**	the motor is started and accelerated as a synchronous motor, but runs as induction motor	the motor is started, accelerated, and run as an induction motor	the motor is started, accelerated, and run as a synchronous motor
576	As shown in the illustration of a turbo-electric propulsion drive system, what type of propulsion motor is used?	squirrel cage AC induction motor	wound rotor AC induction motor	**AC synchronous motor**	shunt wound DC motor
577	As shown in the illustration of a vessels navigational lighting circuit, if port running light "1" burns out, the trouble buzzer will sound and the port running light trouble lamp will illuminate. Switching to port running light "2" clears the alarm. If port running light "1" is replaced with a light of a smaller wattage and the circuit is switched back to port running light "1", which of the following is true?	The new lower wattage light at port running light "1" will immediately burn out.	The trouble relay coil will overheat.	The trouble buzzer may not have sufficient voltage to provide sound.	**There may be insufficient current to energize the trouble relay coil and to open the contacts to silence the alarm.**
578	As shown in the illustration of an older electro-mechanical autopilot system, by what means is the steering order conveyed from the helm to the steering gear?	electrically	electronically	**hydraulically**	pneumatically

ID #	Question	Choice A	Choice B	Choice C	Choice D
579	As shown in the illustration of the elementary diagram of a three speed anchor windlass controller, if the windlass drive motor automatically stops due to a loss of supply voltage, what must be done to resume operations after the restoration of voltage?	the brake cabinet ventilating doors must be re-closed	the motor ventilating doors must be re-closed	the emergency switch must be returned to the "off" position	**the master switch handle must be returned to the "off" position to accomplish reset**
580	As shown in the illustration of the elementary diagram of a three speed anchor windlass controller, which of the following contactor, relay, or timer coils operates with DC voltage?	hoist (H) contactor	first speed (1M) contactor	low voltage (LV) relay	**time delay relay 2T**
581	As shown in the illustration, assuming power is available at the control circuit, which listed action will occur FIRST when the "off-run" switch is placed in the "run" position?	The main contacts (3) "M" close, connecting the motor to line..	The "OL" relay contacts close.	**The contactor coil "M" energizes.**	The disconnect switch (DS) contacts close.
582	As shown in the illustration, by what means are all the 'MS' contacts are opened and closed?	operating coils	magnets	**manual operation of the master switches**	solenoid switches
583	As shown in the illustration, during a normal start-to-run sequence, what would be the status of "SRLS" and "RRLS" respectively?	both "SRLS" and "RRLS" should remain open as long as both the rack mounted contactors are making proper contact with the line and load stabs	**both "SRLS" and "RRLS" should remain closed as long as both the rack mounted contactors are making proper contact with the line and load stabs**	"SRLS" is closed and "RRLS" is open at the instant of startup and the reverse is true in the run mode	"SRLS" is open and "RRLS" is closed at the instant of startup and the reverse is true in the run mode
584	As shown in the illustration, figure "A" represents what type of lighting fixture?	**incandescent**	high pressure mercury	low pressure sodium	high pressure sodium
585	As shown in the illustration, figure "B" represents what type of lighting fixture?	incandescent	**high pressure mercury**	low pressure sodium	high pressure sodium
586	As shown in the illustration, how are the rotor windings of the motor configured?	delta	open delta	**wye**	series-parallel
587	As shown in the illustration, if one of the navigation running light bulbs on service burns out, the operator will receive an alarm. After renewing the burned out light bulb and restoring service to that running light bulb, it is found that the alarm still cannot be silenced. What is the probable cause for this condition in terms of the replacement component?	it burned out rapidly due to its higher voltage rating	it burned out rapidly due to its higher wattage rating	it caused component 'F' to burn out	**it is of a lower wattage rating than required for the alarm relay circuit to activate due to insufficient current flow**

ID #	Question	Choice A	Choice B	Choice C	Choice D
588	As shown in the illustration, if one of the port propulsion motor synchroconverters experienced a failure while underway, how would the system be configured to resume the voyage?	the port propulsion motor would have to be secured entirely	**the port propulsion motor would be operated at half-power using the functional synchroconverter and only one stator winding**	the port propulsion motor would have to be reconfigured so that one synchroconverter could feed both stator windings	the port propulsion motor would have to be reconfigured so that the failed synchroconverter is bypassed and fed directly from the propulsion transformer
589	As shown in the illustration, if the line voltage is 450 VAC, what would be the applied voltage to the motor after the acceleration period with the motor up to speed?	225 VAC	292 VAC	360 VAC	**450 VAC**
590	As shown in the illustration, if the line voltage is 450 VAC, what would be the applied voltage to the motor at the instant of startup and through the acceleration period?	225 VAC	**292 VAC**	360 VAC	450 VAC
591	As shown in the illustration, if the port propulsion motor field excitation circuit experienced a failure, what individual component failure would allow the use of the standby excitation transformer and standby field controller to resume normal operation?	port motor field winding	port rotating rectifier	port rotary transformer	**port field controller**
592	As shown in the illustration, if the protected motor is rated at 15 amps at full load, what is the approximate threshold value where sustained currents below the value result in the overload relay tripping the motor off-line and where sustained currents above the value result in the fuse disconnecting the motor from line?	45	60 amps	**90 amps**	150 amps
593	As shown in the illustration, if the protected motor is rated at 25 amps at full load, what is the approximate locked rotor current value?	50 amps	100 amps	**150 amps**	250 amps
594	As shown in the illustration, in addition to mechanical interlocking of the contactors, how is simultaneous pulling in of both the "1S" and 'R" contactors prevented?	Electrical interlocking by means of normally open "1S" and "R" auxiliary contacts.	**Electrical interlocking by means of normally closed "1S" and "R" auxiliary contacts.**	Electrical interlocking by means of the normally closed, timed open and the normally open, timed closed "2S" contacts.	Mechanical interlocking is the only means by which simultaneous pulling in of the "1S and "R" contactors is prevented.
595	As shown in the illustration, in terms of frequency response characteristics, the various filter circuits illustrated represent what type of filter?	low-pass filter	high-pass filter	**resonant band-pass filter**	interference filter

ID #	Question	Choice A	Choice B	Choice C	Choice D
596	As shown in the illustration, simultaneously pulling in of both the forward and reverse contactors is preventing by both mechanical and electrical means. What statement is true concerning the two means of electrical interlocking used?	the normally closed "R" and "F" auxiliary contacts and the normally closed, time closed "RCR" and "FCR" contacts are all instantaneous interlocks, requiring stopping in one direction before starting in another direction	the normally closed, timed closed "RCR" and "FCR" auxiliary contacts are instantaneous interlocks, requiring stopping in one direction before starting in another direction, whereas the normally closed "R" and "F" contacts require a time-delay associated with coast down after shutting down in one direction before allowing starting in the opposite direction	**the normally closed "R" and "F" auxiliary contacts are instantaneous interlocks, requiring stopping in one direction before starting in another direction, whereas the normally closed, time closed "RCR" and "FCR" contacts require a time-delay associated with coast down after shutting down in one direction before allowing starting in the opposite direction**	the normally closed "R" and "F" auxiliary contacts and the normally closed, time closed "RCR" and "FCR" contacts all require a time-delay associated with coast down after shutting down in one direction before allowing starting in the opposite direction
597	As shown in the illustration, the ammeter measures what current?	It measures the control winding current of the saturable core reactor..	**It measures the total sum of protective anode currents.**	It measures the individual protective anode current as selected.	It measure the individual reference anode current as selected.
598	As shown in the illustration, the change-over switch is what type of device?	single-pole, single-throw switch	single-pole, double-throw switch	double-pole, single-throw switch	**double-pole, double-throw switch**
599	As shown in the illustration, the cost of failure is inversely related to frequency of maintenance, whereas the cost of maintenance is directly related to frequency of maintenance. In this particular illustrated example, what frequency of maintenance would be the most efficient in controlling the total cost?	Biannually	**Annually**	Semi-annually	Quarterly
600	As shown in the illustration, the voltmeter measures what voltage?	It measures the voltage of the electronic regulator output with reference to hull ground.	It measures the average voltage of all the protective anodes with respect to hull ground.	It measures the average voltage of both reference anodes with respect to hull ground.	**It measure the voltage of the selected reference anode with respect to hull ground.**
601	As shown in the illustration, the wet-cell storage batteries are connected in what configuration?	compound	**series**	parallel	tandem
602	As shown in the illustration, under what conditions would the red indicator light be illuminated?	specifically when a safety interlock device prevents motor operation	**any time the motor is connected across line**	any time the motor has been stopped for any reason	specifically when the motor has tripped out on overload

ID #	Question	Choice A	Choice B	Choice C	Choice D
603	As shown in the illustration, using the instructions provided and Chart "A" and Table "24", what size overload relay heater would be the proper selection for the motor associated with the motor nameplate data shown assuming the motor operates at sea level and that the motor ambient temperature is 25 degrees C and the starter ambient temperature is 40 degrees C?	G30T19	G30T20	**G30T21**	G30T22
604	As shown in the illustration, using the instructions provided and Chart "A" and Table "24", what size overload relay heater would be the proper selection for the motor associated with the motor nameplate data shown assuming the motor operates at sea level and that the motor ambient temperature is 40 degrees C and the starter ambient temperature is 25 degrees C?	**G30T19**	G30T20	G30T21	G30T22
605	As shown in the illustration, using the instructions provided and Chart "A" and Table "24", what size overload relay heater would be the proper selection for the motor associated with the motor nameplate data shown assuming the motor operates at sea level and that the motor and its starter share the same ambient temperature?	G30T19	**G30T20**	G30T21	G30T22
606	As shown in the illustration, what are the characteristics of the trouble relay contacts?	two sets of normally open contacts which close when the trouble relay coil is energized	two sets of normally closed contacts which close when the trouble relay coil is energized	two sets of normally open contacts which open when the trouble relay coil is energized	**two sets of normally closed contacts which open when the trouble relay coil is energized**
607	As shown in the illustration, what event would give the same indication that would occur when a stern light circuit fuse blows open?	**stern light "2" burns out**	trouble relay normally closed contacts open	trouble buzzer coil open circuits	stern light trouble lamp burns out
608	As shown in the illustration, what happens when the main feed switch is closed, the change-over switch for the masthead light is in position "2" and the masthead light "2" burns out?	the trouble relay coil energizes	the masthead trouble lamp goes out	**the trouble buzzer sounds and the masthead trouble lamp illuminates**	the masthead circuit fuses blow
609	As shown in the illustration, what is responsible for maintaining the "UV" relay energized when the master switch handle is moved away from the "off" position?	'MS 1' contacts	'MS 2' contacts	**normally open 'UV' contacts**	normally closed 'OL' contacts

ID #	Question	Choice A	Choice B	Choice C	Choice D
610	As shown in the illustration, what is the functional purpose of the normally closed and normally open auxiliary contacts of the hoist and lower contactors respectively?	the normally open hoist and lower contactor auxiliary contacts are interlock contacts preventing simultaneous pulling in both the hoist and lower contactors and the normally closed auxiliary contacts extend control power to the speed control circuits	**the normally closed hoist and lower contactor auxiliary contacts are interlock contacts preventing simultaneous pulling in both the hoist and lower contactors and the normally open contacts extend control power to the speed control circuits**	the normally closed and normally open hoist and lower contactor auxiliary contacts are interlock contacts preventing simultaneous pulling in both the hoist and lower contactors	the normally closed and normally open hoist and lower contactor auxiliary contacts extend control power to the speed control circuits
611	As shown in the illustration, what is the magnetic phase differential in degrees between the reference signal magnetic axis and the control signal magnetic axis of the illustrated diagram for a two-phase induction servo-motor for an automatic radio direction finder?	45	**90**	135	180
612	As shown in the illustration, what is the primary purpose of the first set of primary windings (PRI.1) of the static excitation transformer of the compounded self-excited alternator?	**produce the alternator field excitation current associated with no-load operation**	smooth out transient voltage spikes and dips associated with sudden load changes	produce additional excitation current beyond the no-load current inversely proportional to the actual load current	produce additional excitation current beyond the no-load current proportional to the actual load current
613	As shown in the illustration, what is the purpose of the DC link within the frequency converter?	It merely provides a conducting path between the bridge rectifier output to the controlled inverter input with no other purpose.	**It is an inductor coil that smoothes out the DC current flow outputting from the bridge rectifier on the way to the controlled inverter input.**	It converts the bridge rectifier AC output to the DC required for input to the controlled inverter.	It controls the gate trigger pulses to the controlled inverter, thus controlling the output frequency.
614	As shown in the illustration, what is the purpose of the first set of primary windings (PRI.1) as impacted by the capacitor bank of the compounded self-excited alternator?	produce the alternator field excitation current associated with no-load operation	**improve alternator power factor**	produce additional excitation current beyond the no-load current inversely proportional to the actual load current	produce additional excitation current beyond the no-load current proportional to the actual load current

ID #	Question	Choice A	Choice B	Choice C	Choice D
615	As shown in the illustration, what is the purpose of the first set of primary windings (PRI.1) as impacted by the reactor coils of the compounded self-excited alternator?	produce the alternator field excitation current associated with no-load operation	**smooth out transient voltage spikes and dips associated with sudden load changes**	produce additional excitation current beyond the no-load current inversely proportional to the actual load current	produce additional excitation current beyond the no-load current proportional to the actual load current
616	As shown in the illustration, what is the purpose of the main contacts of contactor "1S"?	**The "1S" contactor connects the autotransformer in wye configuration during the starting/acceleration period.**	The "1S" contactor connects the autotransformer in wye configuration during the run period.	The "1S" contactor connects the autotransformer in delta configuration during the starting/acceleration period.	The "1S" contactor connects the autotransformer to the line during the starting/acceleration period.
617	As shown in the illustration, what is the purpose of the main contacts of contactor "2S"?	The "2S" contactor connects the autotransformer in wye configuration during the starting/acceleration period.	The "2S" contactor connects the autotransformer to the line during the run period.	The "1S" contactor connects the autotransformer in delta configuration during the starting/acceleration period.	**The "2S" contactor connects the autotransformer to the line during the starting/acceleration period.**
618	As shown in the illustration, what is the purpose of the main contacts of contactor "R"?	The "R" contactor connects the autotransformer in wye configuration during the run period.	The "R" contactor connects the autotransformer to the line during the run period.	**The "R" contactor connects the motor directly to the line during the run period. .**	The "R" contactor connects the motor directly to the line during the starting/acceleration period. .
619	As shown in the illustration, what is the purpose of the second set of primary windings (PRI.2) of the static excitation transformer of the compounded self-excited alternator?	produce the alternator field excitation current associated with no-load operation	smooth out transient voltage spikes and dips associated with sudden load changes	produce additional excitation current beyond the no-load current inversely proportional to the actual load current	**produce additional excitation current beyond the no-load current proportional to the actual load current**
620	As shown in the illustration, what is the purpose of the Time Delay (TR) coil in the circuit?	Ensures the motor cannot be started until the overload relays are reset.	Ensures the motor cannot be started until the accelerating coil is energized.	Allows the motor to come up to speed before placing the starting resistors in the circuit.	**Allows the motor to come up to speed at reduced voltage before bypassing the starting resistors.**
621	As shown in the illustration, what maintenance would be required of the circuit components?	Change out the individual navigation light circuit fuses monthly.	**Clean the glass surrounding the individual navigation lights as needed.**	File the points of the buzzer contacts every six months.	Take megger readings on the navigation lights quarterly.

ID #	Question	Choice A	Choice B	Choice C	Choice D
622	As shown in the illustration, what mechanism will disconnect the motor from the line in case of a sustained motor overload?	disconnect switch fuses FU1, FU2, and FU3	**overload relay heaters and overload relay NC contacts (OL)**	transformer primary fuses FU4 and FU5	transformer secondary fuses FU6 and FU7
623	As shown in the illustration, what statement is true concerning each of the system gateways?	Each connects one of two redundant automation area networks with the other automation area network.	Each connects one of two redundant automation area networks with both redundant cargo process area networks.	**Each connects one of two redundant automation area networks with one of two redundant engine control process area networks and one of two redundant cargo process area networks.**	Each connects one of two redundant automation area networks with both redundant engine control process area networks.
624	As shown in the illustration, what statement is true concerning each of the system hubs?	Also known as a ring coupler, the hubs build a safe network by featuring built-in redundancy.	Also known as a ring coupler, the hubs build a safe network by featuring autopartioning for fault isolation.	Also known as a star coupler, the hubs build a safe network by featuring built-in redundancy.	**Also known as a star coupler, the hubs build a safe network by featuring autopartioning for fault isolation.**
625	As shown in the illustration, what type of electric propulsion drive system is featured?	load-commutated converter	**pulse-width modulation converter**	cycloconverter	DC-power converter
626	As shown in the illustration, what type of motor and motor starter are featured?	**non-reversing squirrel cage induction motor with reduced voltage autotransformer starting**	reversing squirrel cage induction motor with across-the-line starting	non-reversing squirrel cage induction motor with reduced voltage primary reactor starting	reversing squirrel cage induction motor with reduced voltage autotransformer starting
627	As shown in the illustration, what type of motor and motor starter are featured?	synchronous motor with across-the-line starting	wound rotor induction motor with across-the-line starting	squirrel cage induction motor with reduced voltage starting	**squirrel cage induction motor with across-the-line starting**
628	As shown in the illustration, what type of motor is controlled as depicted in both figure "A" and in figure "B"?	three phase synchronous motor	three phase squirrel cage induction motor	**three phase wound rotor induction motor**	single phase wound rotor induction motor
629	As shown in the illustration, what type of motor is controlled as depicted in both figures "A", "B", and "C"?	three phase synchronous motor	three phase squirrel cage induction motor	**three phase wound rotor induction motor**	single phase wound rotor induction motor
630	As shown in the illustration, what type of starter is illustrated?	reduced voltage autotransformer starter	reduced voltage secondary resistance starter	**reduced voltage primary resistance starter**	across-the-line starter

ID #	Question	Choice A	Choice B	Choice C	Choice D
631	As shown in the illustration, when transitioning from the electrical plant status indicated by figure "A" to the plant status indicated by figure "B", how is this accomplished manually assuming that the machines are of equal capacity and that the governor droop settings are identical?	**# 1 generator governor speed setting is raised, while #2 generator governor speed setting is lowered**	# 1 generator governor speed setting is lowered, while #2 generator governor speed setting is raised	#1 generator voltage setting is raised, while #2 generator voltage setting is lowered	# 1 generator voltage setting is lowered, while #2 generator voltage setting is raised
632	As shown in the illustration, when transitioning from the electrical plant status indicated by figure "A" to the plant status indicated by figure "B", what is the functional purpose of this transition?	balancing out the amperage load between the two machines	balancing out the power factor between the two machines	balancing out the reactive load (kvar) between the two machines	**balancing out the active load (kW) between the two machines**
633	As shown in the illustration, when transitioning from the electrical plant status indicated by figure "B" to the plant status indicated by figure "C", how is this accomplished manually assuming that the machines are of equal capacity and that the governor droop settings are identical?	# 1 generator governor speed setting is raised, while #2 generator governor speed setting is lowered	# 1 generator governor speed setting is lowered, while #2 generator governor speed setting is raised	**#1 generator voltage setting is raised, while #2 generator voltage setting is lowered**	# 1 generator voltage setting is lowered, while #2 generator voltage setting is raised
634	As shown in the illustration, when transitioning from the electrical plant status indicated by figure "B" to the plant status indicated by figure "C", what is the functional purpose of this transition?	balancing out the amperage load between the two machines	balancing out the power factor between the two machines	balancing out the reactive load (kvar) between the two machines	**all the above**
635	As shown in the illustration, which brush holder is of the reaction type?	1	2	3	**4**
636	As shown in the illustration, which brush holder would be appropriate to use in a bi-directional motor?	**radial mount**	trailing mount only	leading mount only	both leading and trailing mount
637	As shown in the illustration, which electrical symbol represents a diac trigger diode?	7	8	9	**10**
638	As shown in the illustration, which electrical symbol represents a JFET junction field effect transistor?	1	2	**3**	4
639	As shown in the illustration, which electrical symbol represents a NPN type bipolar junction transistor?	1	**2**	3	4
640	As shown in the illustration, which electrical symbol represents a PNP type bipolar junction transistor?	**1**	2	3	4
641	As shown in the illustration, which electrical symbol represents a triac thyristor?	7	8	**9**	10
642	As shown in the illustration, which electrical symbol represents an SCR silicon controlled rectifier?	**7**	8	9	10

ID #	Question	Choice A	Choice B	Choice C	Choice D
643	As shown in the illustration, which listed action will occur when the push button "OL" reset is depressed immediately after the motor has tripped out on overload?	**The overload will not reset until sufficient time has elapsed to allowing for cooling.**	The disconnect switch (DS) contacts will immediately close.	The motor will immediately re-start if the "off-run" switch is in either position.	The overload relay heaters will immediately re-close.
644	As shown in the illustration, which network topography configuration would result in a peer to peer network?	A and B	A and C	**B and C**	C only
645	As shown in the illustration, which of the following conditions will occur as a result of a momentary loss of power?	**The motor will automatically restart when power is restored.**	the "off-run" selector switch will re-open, necessitating a manual restarting of the motor.	The disconnect switch (DS) will re-open, necessitating a manual restarting of the motor.	The normally-closed OL relay contacts will open requiring a manual reset, necessitating a manual restarting of the motor.
646	As shown in the illustration, which of the following pieces of equipment is fed with the three conductor cable with the individual conductors having the smallest cross-sectional area?	S.W. Cooling Circ. Pump No. 1	Cargo Oil Transfer Pump No. 1	Lube Oil Service Pump No. 1	**Sewage Treatment Plant**
647	As shown in the illustration, which of the following pieces of equipment is most likely provided with an autotransformer starter?	S.W. Cooling Circ. Pump No. 1	**Cargo Oil Transfer Pump No. 1**	Lube Oil Service Pump No. 1	Sewage Treatment Plant
648	As shown in the illustration, which of the following pieces of equipment is powered from circuit #3 of group control center No. 1 panel 404?	S.W. Cooling Circ. Pump No. 1	Cargo Oil Transfer Pump No. 1	**Lube Oil Service Pump No. 1**	Sewage Treatment Plant
649	As shown in the illustration, which of the following pieces of equipment is provided with a remote pushbutton station?	S.W. Cooling Circ. Pump No. 1	**Cargo Oil Transfer Pump No. 1**	Lube Oil Service Pump No. 1	Sewage Treatment Plant
650	As shown in the illustration, which of the following pieces of equipment is supplied with a circuit breaker providing both overload and short-circuit protection?	S.W. Cooling Circ. Pump No. 1	Cargo Oil Transfer Pump No. 1	Lube Oil Service Pump No. 1	**Sewage Treatment Plant**
651	As shown in the illustration, which of the following statements is correct concerning the circuits in a sound powered telephone system?	Both the talking and ringing circuits are common circuits.	**The talking circuit is a common circuit and the ringing circuit is a selective circuit. .**	Both the talking and ringing circuits are selective circuits..	The talking circuit is a selective circuit and the ringing circuit is a common circuit.
652	As shown in the illustration, which of the following would prevent simultaneously pulling in both the forward and reverse contactors (which if allowed to happen would insert a short directly across 4160 VAC line)?	opening of the isolation switch handle	opening of the low voltage door	failure to properly rack the reversing contactor	**normal action of the reversing contactor mechanical interlocks**

ID #	Question	Choice A	Choice B	Choice C	Choice D
653	As shown in the tripping curves of the illustration, what is the name of the value at which the OCR and fuse tripping curves cross?	no load current	full-load current	1.25 x full-load current	**locked rotor current**
654	As shown in the two-speed single winding three phase motor connection diagrams illustrated in figure "B", what is the connection scheme associated with high speed operation?	series delta	parallel delta	series wye	**parallel wye**
655	As shown in the two-speed single winding three phase motor connection diagrams illustrated in figure "B", what is the connection scheme associated with low speed operation?	**series delta**	parallel delta	series wye	parallel wye
656	As shown in the two-speed single winding three phase motor connection diagrams illustrated in figure "C", what is the connection scheme associated with high speed operation?	series delta	parallel delta	series wye	**parallel wye**
657	As shown in the two-speed single winding three phase motor connection diagrams illustrated in figure "C", what is the connection scheme associated with low speed operation?	**series delta**	parallel delta	series wye	parallel wye
658	As shown in the two-speed single winding three phase motor connection diagrams illustrated in figures "B", "C", and "D", what type of motor is shown in the motor controller circuit illustrated in figure "A"?	unable to determine whether the motor is a constant torque or a constant horsepower motor	**unable to determine whether the motor is a constant torque or variable torque motor**	unable to determine whether the motor is a variable torque or a constant horsepower motor	the motor is a constant horsepower motor
659	As shown in the wiring diagram of the semi-automatic navigation lighting panel circuit, what would cause the buzzer to sound and for the indicator light to illuminate in the line section for a particular navigation running light?	a blown 10 amp fuse in master section	transfer switch in the "off" position	master switch in the "off" position	**a blown 3 amp fuse in effected line section**
660	As shown in the wiring diagram of the semi-automatic navigation lighting panel circuit, what would cause the buzzer to sound and for the indicator light to illuminate in the line section for a particular navigation running light?	a blown 10 amp fuse in master section	transfer switch in the "off" position	master switch in the "off" position	**a burned out navigation light in effected line section**
661	As shown the illustration of a cycloconverter for an AC synchronous propulsion motor, what statement is true concerning the operating motor frequency?	The operating motor frequency is generally limited to three times the mains line frequency.	**The operating motor frequency is generally limited to less than one-third of mains line frequency.**	The operating motor frequency is generally limited to that equal to the mains line frequency.	The operating motor frequency is generally not limited regardless of the mains line frequency.
662	As shown the illustration of a cycloconverter for an AC synchronous propulsion motor, what statement is true concerning the stator winding connections?	The stator windings are connected in delta configuration only.	The stator windings are connected in wye configuration only.	The stator windings may be connected in delta or wye configuration as required.	**The stator windings are not connected in order to isolate the converters from each other.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
663	Assume that the circuit shown in figure "A" of the illustration represents a two-wire single phase AC ground detecting system. If a ground occurs on line "B" as illustrated, which of the lamps will burn the brightest, before the test pushbutton switch is depressed?	**Lamp "A".**	Lamp "B".	Both lamps "A" and "B"; at equal brightness.	Neither lamp "A" or "B"; both will go out.
664	Assuming a standard 60 Hz input to the circuit shown in the illustration, what would be the ripple frequency?	30 Hz	60 Hz	90 Hz	**120 Hz**
665	Assuming that 450 VAC is the source voltage at the circuit breaker, if 450 volts AC were measured across the load as shown in the illustration as shown in figure "B" of the illustration, what would this indicate?	an open winding between reference point "Y" and the 75% tap connection	a properly operating circuit	**an open winding between the reference point "X" and the 25% tap connection**	a ground on one side of the supply voltage to the autotransformer
666	Assuming that the 3-phase power source has a phase sequence of A-B-C and that the motor is connected as shown in figure "A", if the motor has a clockwise (CW) rotation, what statement is true concerning the motors connected as shown in the other figures?	Motors "B", "C", and "D" would all have a counterclockwise (CCW) rotation.	**Motors "B" and "D" would have a counterclockwise (CCW) rotation and motor "C" would have a clockwise (CW) rotation.**	Motors "B" and "D" would have a clockwise (CW) rotation and motor "C" would have a counterclockwise (CCW) rotation.	Motors "B", "C", and "D" would all have a clockwise (CW) rotation.
667	Assuming that the 3-phase power source has a phase sequence of A-B-C and that the motor is connected as shown in figure "A", if the motor has a counterclockwise (CCW) rotation, what statement is true concerning the motors connected as shown in the other figures?	Motors "B", "C", and "D" would all have a counterclockwise (CCW) rotation.	Motors "B" and "D" would have a counterclockwise (CCW) rotation and motor "C" would have a clockwise (CW) rotation.	**Motors "B" and "D" would have a clockwise (CW) rotation and motor "C" would have a counterclockwise (CCW) rotation.**	Motors "B", "C", and "D" would all have a clockwise (CW) rotation.
668	Assuming the alternator shown in figure "A" of the illustration is equipped with a diode plate as configured in figure "D", what is the purpose of the diode plate?	**It rectifies exciter armature AC to DC for rotating main field excitation and eliminates the need for brushes.**	It inverts exciter armature DC to AC for rotating main field excitation and eliminates the need for brushes.	It rectifies exciter armature AC to DC for rotating main field excitation, but does not eliminate the need for brushes..	It inverts exciter armature DC to AC for rotating main field excitation, but does not eliminate the need for brushes. .
669	Assuming the ladder diagram of figure "1" and the corresponding input/output diagram of figure "2" represents a simple PLC motor controller, what statement is true?	The input switch is a momentary contact start button, output "A" is the motor contactor coil, and output "B" is a motor run status lamp for the running condition.	The input switch is a momentary contact start button, output "A" is the motor contactor coil, and output "B" is a motor run status lamp for the stopped condition.	**The input switch is a maintained contact on-off selector switch, output "A" is the motor contactor coil, and output "B" is a motor run status lamp for the running condition.**	The input switch is a maintained contact on-off selector switch, output "A" is the motor contactor coil, and output "B" is a motor run status lamp for the stopped condition.

ID #	Question	Choice A	Choice B	Choice C	Choice D
670	Assuming the ladder diagram of figure "3" and the corresponding input/output diagram of figure "4" represents a simple PLC motor controller controlling two motors, what statement is true?	It is possible to run motor B without running motor A.	It is NOT possible to run motors A and B simultaneously.	In order to run motor A, it will be also be necessary to run motor B.	**In order to run motor B, it will be also be necessary to run motor A.**
671	At high discharge rates, why are nickel-cadmium storage batteries superior to lead-acid batteries?	they require fewer cells for the same voltage and less mounting space	they are able to produce higher voltages and do not have to be charged as often	**they can be charged and discharged many times without much damage**	they have no individual cells to replace at the end of useful life
672	Attempting to parallel an AC generator which is out of phase with the bus will result in which of the following conditions?	**The alternator breaker should trip.**	The kVA will decrease.	The synchronizing lamps will burn out.	The power factor will be unitized.
673	Auto-transformer starters, sometimes called starting compensators, are sometimes used with larger polyphase induction motors. What function do they perform?	**they reduce the voltage applied to the motor during the starting period**	they increase the voltage for 'across-the-line starting'	they provide a backup means of voltage regulation for emergency starting	they allow the voltage to be either stepped up or down, depending on the application, to ensure full torque
674	Basically, a magnetic amplifier is a saturable-core reactor with the addition of what additional feature?	AC to the bias winding	variable capacitance to all windings	eddy current protectors	**a rectifier in the load circuit**
675	Before any work on electrical or electronic equipment is performed, which of the following precautions should be carried out?	De-energize the applicable switchboard bus.	Bypass the interlocks.	**Secure and tag the supply circuit breaker in the open position.**	Station a man at the circuit supply switch.
676	Before measuring an unknown resistance with an analog multimeter set up as an ohmmeter, what should you do?	adjust the meter's pointer to mid-scale	**short the test leads and calibrate the meter reading to 'zero'**	change the meter's batteries	center the meter's pointer at infinity
677	Before measuring an unknown resistance with an analog multimeter set up as an ohmmeter, what should you do?	adjust the meter's pointers to mid-scale	change the meter's batteries	center the meter's pointer at infinity	**short the test leads and calibrate the meter by zeroing**
678	Before testing insulation with a megohmmeter, the windings of large machines should be grounded for about 15 minutes just prior to the test. Why is this procedure recommended?	insulation may be damaged	insulation may be covered with moisture	armature windings will have a greater number of leakage paths	**larger machines may acquire a charge of static electricity during operation**
679	Before testing insulation with a megohmmeter, the windings of large machines should be grounded for about 15 minutes just prior to the test. Why is this recommended?	**static charge of the machine may give a false reading**	armature will have a greater number of leakage paths	insulation may be damaged	insulation may be covered with moisture

ID #	Question	Choice A	Choice B	Choice C	Choice D
680	Before touching a small capacitor connected to a de-energized circuit, or even one that is completely disconnected, you should do what FIRST?	gently tap the body with a screwdriver	tag it with a de-energized tag	be equipped with an insulated fuse puller	**short circuit the terminals to make sure that the capacitor is discharged**
681	Before using an analog all-purpose electric measuring instrument (multimeter) utilizing internal batteries to supply power for resistance measurements, what should be done FIRST?	remove one of the batteries	remove all the batteries	calibrate using a known external resistance	**select the proper resistance range and calibrate the meter for "zero" ohms**
682	Before using an analog volt-ohmmeter to measure resistance readings, what should you do?	replace all batteries	test the insulation resistance of the leads	make sure the test leads do not touch	**hold the leads together and 'zero' the meter**
683	Before working on an electric cargo winch master switch or controller, what should be done?	spray the gasket surface with a solvent	drain condensate from the box	**open the circuit breaker in the power supply and tag-out**	heat the switch box to remove any moisture
684	Belt drives used in hazardous locations may potentially present an explosion hazard due to the build up of static electricity. According to 46 CFR, Subchapter J (Electrical Engineering), how are belt drives used in hazardous locations required to be equipped?	Use of non-conductive belts	Use of ungrounded pulleys and shafts	Use of conductive belts only	**Use of conductive belts and grounded pulleys and shafts**
685	Besides a condition of overload, what could be a cause of an open armature connection in a DC propulsion motor?	low-load operation	**clogged ventilation ducts**	tripped circuit breaker	excessive starting resistance
686	Besides checking for grounds, for what other purpose can a megohmmeter be used on a DC motor?	**checking for an open field coil**	checking for a shorted field pole	checking for undercut mica	checking for reversed interpole polarity
687	Besides for checking for circuit continuity, what can an ohmmeter be used for in diagnosing a DC motor?	**an open field coil**	synchronous speed	undercut mica	reversed polarity
688	Besides isolating and tagging out the motor, and opening both ends, which of the listed precautions should be taken when cleaning the internals of a motor with compressed air?	Use the highest pressure air available, beyond that of the service air system.	Be certain that the air is clean, but moisture content is permissible to take advantage of the cleaning ability of water.	Be certain that the air is clean, but oil content is permissible to take advantage of the insulating quality of oil.	**Be certain that the air is clean and free of moisture and oil.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
689	Besides the actual amount of bare steel surface, the amount of current flow required for the cathodic protection of a vessel is dependent upon what factor or factors? I. The speed of the ship traveling through the water. II. The temperature of the water.	I only	II only	**Both I and II**	Neither I nor II
690	Besides the fluorescent lamp itself and possibly a starter, which of the following components is included in a fluorescent lighting fixture?	Magnetron	Laser	**Ballast (choke coil)**	Magnetic resonator
691	Besides voltage and frequency, what other factor must be the same when alternators are operating in parallel?	kilowatt load division	amperage load division	reactive load division	**phases in synchronism**
692	Besides voltage regulation, what is a function of the voltage regulators used with AC generators?	To cut out generators when they are no longer required.	To cut in additional generators automatically as required.	To divide the kW load equally between generators operating in parallel.	**To divide the kVAR load equally between generators operating in parallel.**
693	Besides wrapping the rotor in canvas, what is the proper technique to protect the rotor of a wound rotor motor being disassembled for maintenance or overhaul?	Support the rotor by placing the rotor on suitable blocks insuring that the windings and core take the entire weight	**Support the rotor by placing the rotor on suitable blocks insuring that the shaft ends take the entire weight**	Support the rotor by standing it upright and properly securing it in an out of the way corner	Support the rotor by suspending using rigging slings taking care that the windings and core take the entire weight
694	Brushes in a DC generator must be positioned in the neutral plane to avoid excessive sparking associated with the brushes. What device is used to prevent the shifting of the neutral plane due to armature reaction for varying generator loads.	brushing rigging	armature windings	field pole windings	**commutating pole windings**
695	By periodically checking the stator-to-rotor air gap clearance in an induction motor with a feeler gauge, what is prevented?	**rotor contact with the stator**	axial misalignment of the rotor	damage to the motor bearings	electrical damage to the bearings
696	By what common means is the speed of the AC propulsion motor on a diesel-electric propulsion ship controlled?	**by varying the input frequency of the voltage to the motor**	by increasing the motor voltage	by decreasing the motor voltage	by increasing the current to the motor
697	By what means can electrical circuits be protected against overheating? I. Current limiting devices such as circuit breakers and fuses II. Thermal protectors or overload relays	**I only**	II only	Both I and/or II	Neither I nor II

ID #	Question	Choice A	Choice B	Choice C	Choice D
698	By what means does a molded-case breaker provide protection against short circuits?	use of a shading coil	use of an arc quencher	**use of a magnetic trip unit**	use of a thermal trip unit
699	By what means does a molded-case circuit breaker provides protection against short circuits?	**use of a magnetic trip unit**	use of a shading coil	use of an arc quencher	use of a bimetallic strip
700	By what means is the rotation of a three-phase induction motor reversed?	**interchanging any two of the three line leads to the stator**	disconnecting one of the three line leads to the stator	switching the shunt field coil leads	permanently disconnecting any two of the three line leads to the stator
701	By what means is a constant output voltage from an AC generator maintained?	prime mover governor	exciter generator	**voltage regulator**	reverse power relay
702	By what means is a diesel driven emergency generator prevented from being paralleled with the ship's service generators?	**an electrical interlock system**	an automatic paralleling trip switch	the synchronizing oscilloscope	the reverse current relay
703	By what means is an AC generator prevented from becoming motorized?	overspeed trip	**reverse power relay**	back pressure trip	governor controls
704	By what means is an AC generator prevented from becoming motorized?	overspeed trip	**reverse power relay**	back pressure trip	governor controls
705	By what means is DC generator output voltage decreased?	**increasing field resistance**	decreasing field resistance	increasing armature resistance	decreasing armature resistance
706	By what means is protection against sustained overloads occurring in molded-case circuit breakers provided?	an overvoltage release	**a thermal trip unit**	a reverse current relay	a magnetic trip unit
707	By what means is the burning of controller contacts due to arcing, when opening, prevented?	coating the contact surfaces lightly with petroleum jelly	**magnetic blowout coils**	an overvoltage release	an overcurrent release
708	By what means is the capacity of a battery given in terms of a rating?	volts	volt-amperes	volt-hours	**ampere-hours**
709	By what means is the division of the reactive kVAR load between paralleled AC generators automatically controlled?	prime mover governors	**voltage regulators**	phase balance relay	proportioner
710	By what means is the frequency of an AC generator adjusted?	main alternator field rheostat	exciter field rheostat	**prime mover governor control**	equalizing reactor
711	By what means is the frequency of an AC generator controlled?	rheostat	**governor**	exciter	capacitor
712	By what means is the frequency of an alternator adjusted from the main switchboard?	frequency meter	voltage regulator	**governor control**	sychroscope switch
713	By what means is the output voltage of a 440 volt, 60 Hz AC generator controlled?	varying the load on the alternator	varying the load on the prime mover	varying the speed of the prime mover	**varying the exciter output voltage**
714	By what means is the voltage of an operating AC turbo generator raised or lowered?	exciter generator governor controls	synchronizing switch	phase sequence switch	**generator field exciter**
715	By what means is the voltage output of an AC generator accurately controlled?	changing the sensitivity of the prime mover to large changes in voltage	varying the reluctance of the air gap	**varying the DC exciter voltage**	shorting out part of the armature windings

ID #	Question	Choice A	Choice B	Choice C	Choice D
716	By what means is voltage and current generated by modern revolving field AC generators brought out from the alternator enclosure to the connected switch board?	brushes on a commutator	brushes on slip rings	brushes on collector rings	**direct connections from the stator**
717	By what means should motor controller contacts be routinely cleaned?	blowing with compressed air	filing with a bastard file	**wiping with a clean dry cloth**	dressing with crocus cloth
718	By what mechanism does a reverse-power relay prevent AC generator motorization?	automatically redirecting the load	automatically speeding up the prime mover	tripping the panel board main switch	**tripping the generator circuit breaker**
719	Capacitance is the property of an electric circuit opposing a change in what value of a circuit?	current in the circuit	**voltage in the circuit**	inductance in the circuit	resistance in the circuit
720	Capacitors are commonly used on DC power supply circuits for engine room automation consoles. For what functional purpose are they primarily used in this application?	**filter out 'ripple' from rectification**	prevent overloads	act as a permanent load	decrease the average value of the output voltage
721	Capacitors can be used in electric distribution systems to improve power factor. This is accomplished by seesawing energy between the capacitor and what device or devices?	generator	**inductive loads**	resistive loads	capacitive loads
722	Circuit resistance is usually measured off-line (de-energized) with an ohmmeter. In the absence of an ohmmeter, however, resistance may be INDIRECTLY measured on-line (energized) using what meter (or meters)?	voltmeter only	ammeter only	**voltmeter and an ammeter**	frequency meter
723	Coast Guard Regulations (46 CFR Part 111) permit which of the listed types of fuses to be used in an interior lighting circuit?	Phillips-base plug type	Renewable link cartridge type	**Non-renewable link cartridge type**	All of the above
724	Compared to conventional alternators, brushless alternators are designed to operate without the use of what?	**slip rings and commutators**	exciters	voltage regulators	rectifiers
725	Compared to the fuse being replaced, what should be the characteristic of the replacement fuse for a fuse that blows often?	**the recommended current and voltage rating**	higher current and voltage rating than the fuse being replaced	higher current and lower voltage rating than the fuse being replaced	lower current and higher voltage rating than the fuse being replaced
726	Compared to the original wire, what will be the resistance of a replacement wire having twice the length and one-half the cross-sectional area of the original?	**four times that of the original wire**	twice that of the original wire	the same as that of the original wire	one-half that of the original wire

ID #	Question	Choice A	Choice B	Choice C	Choice D
727	Concerning figure "A" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what do the "Output" load and contacts represent?	**the load is a motor contactor coil and the contacts are a set of normally open, auxiliary holding contacts used for latching purposes**	the load is the actual motor itself and the contacts are normally open, auxiliary holding contacts used for latching purposes	the load is a motor contactor coil and the contacts are a set of normally closed, auxiliary holding contacts used for latching purposes	the load is the actual motor itself and the contacts are normally closed, auxiliary holding contacts used for latching purposes
728	Concerning figure "A" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what does "Input A" represent?	normally open, maintained contact on-off selector switch	**normally open, momentary contact start pushbutton switch**	normally closed, momentary contact stop pushbutton switch	normally closed, maintained contact on-off selector switch
729	Concerning figure "A" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what does "Input B" represent?	normally open, maintained contact on-off selector switch	normally open, momentary contact start pushbutton switch	**normally closed, momentary contact stop pushbutton switch**	normally closed, maintained contact on-off selector switch
730	Concerning figure "B" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what do the "Internal relay 1" load and contacts represent?	An electro-magnetic relay internal to the PLC used to execute the stop command when the normally closed, momentary contact stop pushbutton switch (Input 2) is depressed.	An electro-magnetic relay internal to the PLC used to execute the stop command when the normally open, momentary contact stop pushbutton switch (Input 2) is depressed.	Programmed bits of data stored in memory used to execute the stop command when the normally closed, momentary contact stop pushbutton switch (Input 2) is depressed.	**Programmed bits of data stored in memory used to execute the stop command when the normally open, momentary contact stop pushbutton switch (Input 2) is depressed.**
731	Concerning figure "B" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what do the "Output 1" load and contacts represent?	**the motor contactor coil and a set of normally open, auxiliary holding contacts used for latching purposes**	the actual motor itself and normally open, auxiliary holding contacts used for latching purposes	the motor contactor coil and a set of normally closed, auxiliary holding contacts used for latching purposes	the actual motor itself and normally closed, auxiliary holding contacts used for latching purposes
732	Concerning figure "B" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what do the "Output" load and contact represent?	**the load is a motor contactor coil and the contacts are a set of normally open, auxiliary holding contacts used for latching purposes**	the load is the actual motor itself and the contacts are normally open, auxiliary holding contacts used for latching purposes	the load is a motor contactor coil and the contacts are a set of normally closed, auxiliary holding contacts used for latching purposes	the load is the actual motor itself and the contacts are normally closed, auxiliary holding contacts used for latching purposes
733	Concerning figure "B" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what does "Input 1" represent?	normally open, maintained contact on-off selector switch	**normally open, momentary contact start pushbutton switch**	normally closed, momentary contact stop pushbutton switch	normally closed, maintained contact on-off selector switch

ID #	Question	Choice A	Choice B	Choice C	Choice D
734	Concerning figure "B" of the illustration, if the illustrated PLC ladder diagram is for a simple motor controller, what does "Input 2" represent?	normally open, maintained contact on-off selector switch	normally open, momentary contact start pushbutton switch	**normally open, momentary contact stop pushbutton switch**	normally closed, maintained contact on-off selector switch
735	Concerning the arrangement of equipment and associated hoses shown in the illustration, what statement is true?	When recovering refrigerant from the centrifugal chiller using this method, the refrigerant is being recovered as a liquid.	When recovering refrigerant from the centrifugal chiller using this method, the containment tank should be vented back to the chiller evaporator shell.	**When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.**	When recovering refrigerant from the centrifugal chiller using this method, the entire charge may be removed in one procedure.
736	Concerning the arrangement of equipment and associated hoses shown in the illustration, what statement is true?	Refrigerant is being recovered from the centrifugal chiller as a vapor.	Refrigerant is being charged into the centrifugal chiller quicker than can be achieved with a liquid pump.	**Refrigerant is being charged into the centrifugal chiller as pure vapor leaving non-volatile contaminants such as oil remaining in the refrigerant containment tank.**	Refrigerant is being recovered from the centrifugal chiller as a liquid.
737	Concerning the arrangement of equipment and associated hoses shown in the illustration, what statement is true?	When recovering refrigerant from the centrifugal chiller using this method, it is permissible to exceed 90% of the weight capacity of the refrigerant drum.	When recovering refrigerant from the centrifugal chiller using this method, the vent hose connection should be closed.	When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.	**When recovering refrigerant from the centrifugal chiller using this method, it minimizes the risk of chiller tube freeze-up.**
738	Concerning the control logic as shown in figures "A" and "B", what statement is true?	**a trigger output occurs once during one cycle of the PLC program by means of the cycle control internal relay**	a trigger output occurs once during one cycle of the PLC program by means of the cycle control electromagnetic relay	a trigger output occurs repeatedly during one cycle of the PLC program by means of the cycle control internal relay	a trigger output occurs repeatedly during one cycle of the PLC program by means of the cycle control electromagnetic relay

ID #	Question	Choice A	Choice B	Choice C	Choice D
739	Concerning the illustrated fire detection and alarm system, what statement is true concerning the wiring between zones?	The zones are all connected in series by means of the fire locating switches only.	The zones are all connected in series by means of the ground locating switches only.	**The zones are all connected in series by means of the fire locating switches and the ground locating switches.**	The zones are all connected in parallel by means of the fire locating switches and the ground locating switches.
740	Concerning the illustrated fire detection and alarm system, what statement is true concerning the wiring within a zone?	**The thermostats, manual stations, and test station for each zone are all wired in series with each other and are normally closed.**	The thermostats, manual stations, and test station for each zone are all wired in series with each other and are normally open.	The thermostats, manual stations, and test station for each zone are all wired in parallel with each other and are normally closed.	The thermostats, manual stations, and test station for each zone are all wired in parallel with each other and are normally open.
741	Concerning the illustrated fire detection and alarm system, when the system is operating normally and under supervision, what is the status of the ground detector and the fire alarm relays?	Both the ground detector and the fire alarm relays are both energized.	Both the ground detector and the fire alarm relays are both de-energized.	The ground detector relay is energized and the fire alarm relay is de-energized.	**The ground detector relay is de-energized and the fire alarm relay is energized.**
742	Concerning the illustrated motor controller circuit, where is the location of the motor "run" indicator light?	At the local control station.	**At the remote control station.**	At the motor.	There is no motor "run" light. It is, instead, a motor "stopped" light.
743	Concerning the illustrated motor controller circuit, which statement is true?	The local and remote start button switches are wired in series with one another.	The local and remote stop button switches are wired in parallel with one another.	The motor status light is a motor "stopped" light..	**The local stop switch and the overload relay reset mechanism utilize the same button.**
744	Concerning the piping schematic of the direct expansion chiller as shown in figure "A" of the illustration, what statement is true?	Hot gas bypass keeps the low side pressure high enough to prevent chiller freeze-up under low load conditions and liquid injection keeps the suction vapor cool enough to prevent overheating of the hermetic compressor motor under high load conditions.	**Hot gas bypass keeps the low side pressure high enough to prevent chiller freeze-up under low load conditions and liquid injection keeps the suction vapor cool enough to prevent overheating of the hermetic compressor motor under low load conditions.**	Hot gas bypass keeps the low side pressure high enough to prevent chiller freeze-up under high load conditions and liquid injection keeps the suction vapor cool enough to prevent overheating of the hermetic compressor motor under high load conditions.	Hot gas bypass keeps the low side pressure high enough to prevent chiller freeze-up under high load conditions and liquid injection keeps the suction vapor cool enough to prevent overheating of the hermetic compressor motor under low load conditions.

ID #	Question	Choice A	Choice B	Choice C	Choice D
745	Concerning the piping schematic of the multi-temperature and multi-evaporator system as shown in figure "B" of the illustration, what statement is true?	The uppermost evaporator coil is a frosting evaporator and the lowermost evaporator coil is a non-frosting evaporator.	The hot gas solenoid valve opens under low load conditions to prevent frost build-up on the non-frosting evaporator coil.	The hot gas solenoid valve opens when the frosting evaporator requires defrosting and the bypass regulator injects enough liquid into the compressor suction line to prevent hermetic motor overheating.	**The hot gas solenoid valve opens when the frosting evaporator requires defrosting and the bypass regulator bypasses enough gas around the evaporator during defrosting to prevent liquid flood back to the compressor.**
746	Consider a series circuit employing two resistors. What is true about the resistance value of the second resistor compared to the first when the voltage drop across the first resistor is one half the source voltage?	**the second resistor has a resistance value equal to that of the first**	the second resistor has a resistance value that is half of the first	the second resistor has a resistance value double that of the first	the second resistor has a resistance value relative to that of the first which cannot be determined
747	Consider a three-phase squirrel cage induction motor rated at 450 VAC and 60 Hz. What would happen to the motor if the line frequency dropped from the normally supplied 60 Hz to 55 Hz and the voltage remained normal at 450 VAC.	**run at a slower speed**	operate at a lower current	vibrate excessively	trip off the line
748	D.C. propulsion motor brush pressure depends on the brush grade used. In practice with what device is the proper brush pressure established?	multimeter	manometer	**spring scale**	compound gauge
749	DC generator circuits are protected against malfunctions due to prime mover power loss by the use of what device (or devices)?	main bus disconnect links	a separate battery backup	**reverse current relays**	reverse power relays
750	Decreasing the frequency in a capacitive circuit while maintaining a constant circuit voltage, will result in what change?	an increase in apparent power	**a decrease in circuit current**	a decrease in capacitive reactance	a decrease in total impedance
751	Diesel generators #1 and #2 are operating in parallel at near full load capacity. Diesel generator #1 suddenly trips out mechanically due to low lube oil pressure. The reverse power relay functions properly and trips generator #1 electrically off the board. Which of the following actions should you carry out FIRST?	Start the emergency generator.	Ascertain cause of the low lube oil pressure.	**Strip the board of all nonvital circuits.**	Secure alarms, reset reverse power relay, and restart #1 engine.
752	Due to the operating characteristics of the system, time lag fuses (or dual-element fuses) are necessary for use in what types of circuits?	main lighting circuits	**motor starting circuit**	emergency lighting circuits	general alarm circuits

ID #	Question	Choice A	Choice B	Choice C	Choice D
753	During discharge of a lead-acid storage battery, which of the following actions occurs?	The acid becomes stronger.	Both plates change chemically to ammonium chloride.	**The acid becomes weaker.**	Hydrogen gas is liberated.
754	During its operation, loud buzzing and resultant welding of contacts of a magnetic relay may occur. What which of the following would be likely cause?	overheating of the contactor coil	**low voltage on the operating coil**	low insulation resistance to ground	lubrication of the contact bearing points
755	During start-up of the circuit shown in figure "B" of the illustration, it is noted that the ends of component "4" alternately glow and become dark without the tube illuminating. What is the most probable cause for this condition?	component "2" is loose and due to the ship's vibrations makes and breaks contact	the power system's voltage is fluctuating in and out of the range necessary for proper operation	**component "3" is shorted and therefore unable to produce the high voltage required to start the lamp**	component "5" contacts are opening and closing thus prohibiting sufficient current flow
756	During the start-up of the circuit shown in figure "B" of the illustration, it is noted that the ends of component "4" remain lighted but the tube does not illuminate. What is likely the cause of this problem?	component "3" is open	component "2" is closed	component "4" is the wrong wattage	**component "5" contacts are stuck closed**
757	Electric current is the flow of electrons through a conductor. How is the rate of this flow measured?	volts	**amperes**	ohms	watts
758	Electric current is the flow of electrons through a conductor. In what units is the rate of current flow measured?	volts	**amperes**	coulombs	ohms
759	Electric motors intended for use outside the engine room and boiler room are frequently rated to run at a designed ambient temperature of 40°C. What is the equivalent temperature in degrees Fahrenheit?	54.2°F	72.0°F	**104.0°F**	129.6°F
760	Electrical failures in motors are caused by the breakdown of insulation, which is a function of the aging process. What is another contributing factor to insulation breakdown?	habitually running of a motor at low loads	**chronic overheating of a motor regardless of reason**	failure to run a continuous duty motor on a continuous basis	habitual operation of a motor at low ambient temperatures
761	Electrical wire in general, when used aboard vessels must meet minimum requirements. Which of the following statements is/are correct?	Each wire must be 14 AWG or larger, regardless of locations and use.	**Wire must be of the stranded copper type.**	Wire must be of the solid copper type.	Wire need not be in an enclosure nor component insulated?

ID #	Question	Choice A	Choice B	Choice C	Choice D
762	Emergency generators are required to automatically start upon a loss of normal supply voltage, according to 46 CFR, Subchapter J (Electrical Engineering). In conducting a test of the emergency generator automatic start function, if the normal system supply voltage is 450 VAC, to what value would the normal supply voltage have to drop to trigger the automatic starting of the emergency generator?	The voltage must drop to 247.5 VAC.	The voltage must drop to 270.0 VAC.	The voltage must drop to 382.5 VAC.	**The voltage must drop to within a range from as low as 270 VAC to as high as 382.5 VAC.**
763	Emergency generators are required to automatically start upon a loss of normal supply voltage, according to 46 CFR, Subchapter J (Electrical Engineering). In conducting a test of the emergency generator automatic transfer of load function, if the normal system supply voltage is 450 VAC, to what value would the emergency generator output voltage have to rise to trigger the automatic transfer of emergency loads to the emergency generator?	The voltage would have to rise to 382.5 VAC.	The voltage would have to rise to 427.5 VAC.	**The voltage would have to rise to a value between from 382.5 VAC to 427.5 VAC.**	The voltage would have to rise to a value ranging from between 405 VAC to 450 VAC.
764	Emergency generators are required to automatically start upon a loss of normal supply voltage, according to 46 CFR, Subchapter J (Electrical Engineering). In conducting a test of the emergency generator automatic transfer of load function, if the normal system supply voltage is 480 VAC, to what value would the normal source output voltage have to rise to trigger the automatic transfer of emergency loads back to the normal power source?	It would have to rise to 408 VAC.	It would have to rise to 456 VAC.	**It would have to rise to a value between from 408 VAC to 456 VAC.**	It would have to rise to a value between from 440 VAC to 460 VAC.
765	Emergency generators are required to automatically start upon a loss of normal supply voltage, according to 46 CFR, Subchapter J (Electrical Engineering). In conducting a test of the emergency generator automatic transfer of load function, what is the maximum amount of time allowed for the automatic transfer of load to the emergency generator?	15 seconds	30 seconds	**45 seconds**	60 seconds

ID #	Question	Choice A	Choice B	Choice C	Choice D
766	Emergency generators are required to automatically start upon a loss of normal supply voltage, according to 46 CFR, Subchapter J (Electrical Engineering). In conducting a test of the emergency generator capacity function, the emergency generator fuel tank on an ocean going cargo vessel of 1600 GT or more must be capable of supplying fuel to a fully loaded engine for a time period of at least how many hours?	6 hours	8 hours	**18 hours**	36 hours
767	Erratic operation of the device represented in the diagram labeled "A" shown in the illustration could be traced to what condition?	**improper contact at "R" slip rings or "S" connections**	a low three-phase voltage supply	improper contact at "S" slip rings or "R" connections	a high three-phase voltage supply
768	Excessive buzzing of AC contactors may be caused by what condition?	burnt arc shields	shorted armature coils	**a broken shading coil**	high voltage
769	Figure "A" of the illustration represents a constant frequency system. At load condition "1" machine A has a 40 kW load and machine B has a 120 kW load as shown. If load is to be transferred manually to achieve load condition "2" with machine A having a load of 100 kW and machine B having a load of 60 kW, how is this accomplished?	The governor control switch of machine A is turned to raise speed, while the governor control switch of machine B is turned to lower speed.	The governor control switch of machine A is turned to lower speed, while the governor control switch of machine B is turned to raise speed.	**The governor control switch of machine A is turned to raise speed, while the governor control switch of machine B is not touched.**	The governor control switch of machine B is turned to lower speed, while the governor control switch of machine A is not touched.
770	For accuracy purposes, which of the following devices should be used to measure the temperature of a battery electrolyte?	Mercury thermometer	**Electronic digital thermometer**	Thermocouple pyrometer	Potentiometer
771	For more complete vessel protection when using an impressed current cathodic system, what other features are built into the system?	all ship's service alternators have additional temperature sensing devices and a thermal recorder installed	machinery on deck and in the engine room is first coated with zinc chromate before final painting	the hull's magnetic fields are aligned with a solid-state degaussing circuit using SCR's	**straps connect the rudder with the hull and the propeller shaft is grounded through a slip ring/brush arrangement**
772	For practical purposes, in a series circuit employing three resistors all with different resistance values, across which resistor will the largest voltage drop occur?	the resistor with the lowest resistance value	**the resistor with the largest resistance value**	the resistor closest to the source regardless of its resistance	all the voltage drops will be equal across all the resistors
773	For routine cleaning of a commutator, what should be applied?	course sandpaper in a slow back and forth motion across the commutator slots	an emery cloth parallel to the axis of the commutator	**a canvas wiper on the commutator while running**	a fine tooth file to the commutator while running

ID #	Question	Choice A	Choice B	Choice C	Choice D
774	For the purpose of calculating apparent power, which of the following procedures should be used to determine the total load current of a three-phase, delta wound, AC generator?	Multiply the amperage in one phase by three.	Divide the total amperage in all phases by three.	**Multiply the amperage in one phase by the square root of three.**	Divide the total amperage in all phases by the square root of three.
775	For what purpose are thermal strip heaters provided in DC main propulsion motors?	**prevent moisture buildup in windings when motor is idle**	maintain a relatively constant temperature in the motor enclosure	prevent the rotor from warping while in operation	provide an additional means of starting resistance
776	For what purpose are time delayed or delayed action-type fuses used?	prevent grounds in branch circuits	prevent opens in motor circuits	**permit momentary overloads without melting**	guard lighting and electronic circuits
777	For what purpose is the variable resistance placed in the rotor circuit of a wound-rotor induction motor provided?	**speed control**	frequency control	voltage control	torque control
778	For what reason should engine room watchstanders keep a constant check on the loads carried by electric motors?	low loads necessitate frequent insulation cleaning	**exceeding nameplate currents shortens useful life**	energy is wasted if full loading is not utilized	residual magnetism may increase
779	Four lamps are connected in parallel in a single circuit. If one of the lamp burns out, what will happen to the other lamps?	all go out	become dimmer	**burn with their original intensities**	become brighter
780	From the illustration shown in figure "C", what can be determined from the speed droop characteristics of generator A and generator B?	Generator A has a greater speed droop value than generator B and generator A will take a greater share of the load than generator B.	**Generator A has a lower speed droop value than generator B and generator A will take a greater share of the load than generator B.**	Generator A has a greater speed droop value than generator B and generator B will take a greater share of the load than generator A.	Generator A has a lower speed droop value than generator B and generator B will take a greater share of the load than generator A
781	From the information given in the illustration, what would be the ampere capacity at full load of each of the main ship service diesel generators if operating at the rated power factor of 0.8?	2500 amps	**3011 amps**	3125 amps	5208 amps
782	From the information given in the illustration, what would be the maximum output amperage available from the emergency generator if it operated with a power factor of 0.9?	541 amps	**669 amps**	937 amps	1156 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
783	From the information given in the illustration, which of the following statements is correct?	**Automation should automatically start the emergency generator and close its circuit breaker if the main-emergency bus-tie circuit breaker is manually tripped open.**	In the normal mode, the 480 VAC emergency bus receives its power from the emergency generator circuit breaker.	Shore power, while in port, may only be provided if the ship is tied up port side to the dock.	In the emergency mode, the 480 VAC group control centers are capable of being powered from the emergency diesel generator.
784	From the information given in the illustration, which of the following statements is correct?	It is possible for the main-emergency bus-tie circuit breaker and the emergency generator circuit breaker to be simultaneously closed.	**It is normally the case where the main-emergency bus-tie circuit breaker and any on-line ship's service generator circuit breakers be simultaneously closed.**	Shore power, in port, is only capable of feeding emergency loads.	The emergency generator is capable of being connected directly to the main 480 VAC bus.
785	From the instant of start-up, through the acceleration period, and until the motor reaches rated speed, when is the counter EMF produced in the windings of a DC motor 'zero'?	armature has just begun to turn	**armature is not yet turning**	motor is almost up to rated speed	motor is at rated speed
786	Fuses are sometimes placed in series with a thermal trip-type circuit breaker. What is the purpose of a fuse used in this arrangement?	time-delay protection	**short-circuit protection**	short duration surge protection	sustained overload protection
787	Given the circuit and individual AC and DC voltage waveforms shown in figure "A" producing the composite voltage waveform shown in figure "B", what would be the value of the average current passing through the load resistor with a resistance of 1 ohm?	10 amps	**20 amps**	30 amps	40 amps
788	Given the circuit and individual AC and DC voltage waveforms shown in figure "A" producing the composite voltage waveform shown in figure "B", what would be the value of the peak to peak voltage?	10 volts	**20 volts**	30 volts	40 volts

ID #	Question	Choice A	Choice B	Choice C	Choice D
789	Given the circuit and input and output waveforms shown in figure "E" of the illustration, what function does the coupling transformer perform?	The transformer removes the DC component from the varying DC input to produce an AC output that is in phase with the AC component input.	The transformer removes the DC component from the varying DC input to produce an AC output that leads the AC component input by 90 electrical degrees.	**The transformer removes the DC component from the varying DC input to produce an AC output that lags the AC component input by 90 electrical degrees.**	The transformer removes the DC component from the varying DC input to produce an AC output that lags the AC component input by 180 electrical degrees.
790	Given the circuit and input and output waveforms shown in figure "F" of the illustration, what function does the coupling capacitor perform?	The capacitor removes the DC component from the varying DC input to produce an AC output that leads the AC component input by 90 electrical degrees.	The capacitor removes the DC component from the varying DC input to produce an AC output that lags the AC component input by 90 electrical degrees.	The capacitor removes the DC component from the varying DC input to produce an AC output that leads the AC component input by 180 electrical degrees.	**The capacitor removes the DC component from the varying DC input to produce an AC output that is in phase with the AC component input.**
791	Grease coatings on electrical contact surfaces increase contact resistance. How should grease accumulations be removed?	small wire brush	compressed air jet	**clean dry cloth**	10% solution carbon tetrachloride solvent and water
792	Grounds occurring in electrical machinery as a result of insulation failure may result from deterioration over time and excessive heat. What could be another contributing cause?	extended periods of operation at low ambient temperature	extended periods of operation at low load	**extended periods of vibration**	extended operation at normal loads
793	High pressure compressed air should not be used to clean electric motors or controller equipment. Why not?	**it may embed metallic particles into coil insulation**	the surrounding area may need additional cleaning	the air blast dries out insulation quickly	a mask and respirator would be required
794	How are AC and DC generators are similar?	**They both internally generate alternating current voltages.**	They both rectify the current before delivery.	They are both constructed at the same physical size for the same kilowatt rating	They both internally produce three-phase power.
795	How are AC and DC generators are similar?	**They both internally generate alternating current voltages.**	They both rectify the voltage before delivery.	They both operate at 60 cycles.	They both supply three-phase power.
796	How are electric circuits protected against overloads and short circuits?	safety disconnect switches (knife type)	bus links	**circuit breakers and/or fuses**	using undersized conductors in terms of ampacity
797	How are fuses rated?	voltage and amperage only	amperage only	interrupting capacity only	**voltage, amperage, and interrupting capacity**
798	How are fuses usually rated?	watts	amps only	volts and amps only	**volts, amps, and interrupting capacity**

ID #	Question	Choice A	Choice B	Choice C	Choice D
799	How are operational amplifiers, used primarily in analog circuits, characterized?	**high input impedance, high gain and low output impedance**	high input impedance, high gain and high output impedance	low input impedance, low gain and high output impedance	low input impedance, high gain and low output impedance
800	How are power transformers rated?	kilowatts-amps	ampere-turns	kilowatt-volts	**kilovoltamperes**
801	How are the field windings of a DC shunt generator connected?	in series with the series windings	in parallel with the field rheostat	in series with the armature windings	**in parallel with the armature windings**
802	How are the line losses in a distribution circuit kept to a minimum?	adding rubber insulation conductors to the circuit	using higher current and lower voltage	increasing the number of thermal relays in the circuit	**using higher voltage and lower current**
803	How are the number of cycles per second developed by the alternator aboard your vessel determined?	**the speed of the engine driving the alternator**	the resistance applied to the field rheostat	the synchronous speed of induction	the adjustments made to the voltage regulator
804	How can a motor be protected from overheating due to sustained motor overload?	**thermal circuit breaker**	single element fuse	quick-acting fuse	magnetic circuit breaker
805	How can a shorted armature coil in a DC motor be detected?	**sparking at the brushes**	shiny armature coil	worn grooves in the armature	undercut mica
806	How can equalization of the power factors of two alternators operating in parallel be accomplished?	manually, by adjusting the governor controls	**automatically, by automatic voltage regulators**	manually, adjusting the output of current transformers	automatically, by the designed action of the governors
807	How can hysteresis losses in transformers be reduced?	by laminating the core	**by using special silicon steel materials**	by using higher voltages	by using heavy gage wire
808	How can the charge of a lead-acid battery be restored?	by passing alternating current through the cell	**by passing direct current through the cell backward against the flow of normal discharge current**	by passing a direct current through the cell forward with the flow of normal discharge current	by adding acid to the electrolyte
809	How can the direction of rotation of a DC motor be reversed?	**reversing the field or armature connections**	reversing both the field and the armature connections	wiring the field and armature in parallel	wiring the field and armature in series
810	How can the direction of rotation of a DC propulsion motor can be changed?	reversing brush holder position	**reversing polarity of the field poles**	reversing the brush staggered order	reversing the motor interpole connections
811	How can the loss of residual magnetism in an alternator or generator be corrected?	running the rotor in the opposite direction for 5 minutes	allowing the generator to run at 10% of normal speed for 5 minutes	running the generator at normal speed with the field rheostat fully counterclockwise	**using a storage battery or battery charger to 'flash' the field**
812	How can the nominal resistance value of a typical carbon resistor in a circuit best be determined?	by the single solid body color of the resistor	**by the band markings on the resistor**	by the resistance value written on the resistor	by the physical size of the resistor

ID #	Question	Choice A	Choice B	Choice C	Choice D
813	How can you determine if a circuit breaker has tripped?	**examining the position of the circuit breaker handle**	checking to see if the circuit breaker is warm	looking for heat discoloration at the circuit breaker	using thermal imagery of the circuit breaker
814	How can you determine if a circuit breaker is tripped?	**by examining the position of the circuit breaker handle**	by checking to see if the circuit breaker is warm	by looking for heat discoloration of the circuit breaker	by looking for the tripped circuit breaker light
815	How does a circuit breaker differ from a fuse?	a circuit breaker melts and must be replaced, a fuse does neither	a circuit breaker is enclosed in a tube of insulating material with metal ferrules at each end, a fuse is not	a circuit breaker gives no visual indication of having opened the circuit, a fuse universally does	**a circuit breaker trips to break the circuit and may be reset, a fuse may not be reset**
816	How does a synchronous motor maintains synchronism with the rotating field?	the field strength varies directly with rotor slip	**the DC current applied to the rotor coils causes the rotor magnets to lock in with the rotating magnetic flux of the stator**	the stator poles are dragged around due to the magnetic flux created by the excitation current	the stator magnetic flux rotates in the opposite direction
817	How does the resistance of a conductor vary?	**directly as its length and inversely as its cross-sectional area**	inversely as its length and directly as its cross-sectional area	directly as its length and directly as its cross-sectional area	inversely as its length and inversely as its cross-sectional area
818	How is a short in the shunt field of a DC motor best located?	visual inspection of the commutator	**applying AC voltage to the shunt field circuit and measuring the voltage drop across each field coil**	using a growler and hacksaw blade	isolating each coil from the others and using a megohmmeter
819	How is a wattmeter electrically connected in a circuit?	In series	In parallel	**In series-parallel**	Inductively
820	How is electrical conductor insulation classed? Example: insulation class H	conductor current carrying capacity	voltage rating of the insulation	conductor ampacity	**limiting internal hot spot temperature**
821	How is he charge of a lead-acid battery normally checked?	manometer	**hydrometer**	pneumercator	ohmmeter
822	How is local action in a lead-acid battery offset?	separating the positive and negative plates with plastic spacers	separating the positive and negative plates with resin impregnated spacers	adding a small amount of paraffin oil to the electrolyte	**trickle charging**

ID #	Question	Choice A	Choice B	Choice C	Choice D
823	How is power loss expressed as the result of the heating of conductors due to resistance in distribution circuit cabling?	line droop	**line loss**	IR drop	hysteresis
824	How is reversal of a DC propulsion motor achieved?	**reversing the direction of current flow in the motor field windings**	the use of a shunt field regulator	reversing the phase sequence of the incoming voltage	the use of a 12 pulse converter
825	How is speed control of a DC propulsion motor accomplished?	adjusting the output frequency of the electric power source	the use of a load-commutated inverter	the use of static power converters	**adjusting the input voltage to the motor**
826	How is the difference between the synchronous speed of a three phase induction motor and its operating speed correctly expressed?	a percent of full load speed	a decimal fraction of full load speed	**slip**	deviation
827	How is the direction of propeller shaft rotation changed when directly coupled to an AC synchronous motor when driven by a variable frequency alternator in an AC turbo-electric drive system?	Reversing the polarity of the propulsion motor	Reversing the polarity of the propulsion generator	**Reversing the phase sequence of power to the motor**	Reversing the rotation of the steam turbine
828	How is the direction of rotation of the main propulsion motor in a modern AC propulsion drive system reversed?	changing the direction of current flow in the motor's field winding	reversing the direction of current flow in the armature	**electronically changing the phase sequence of the voltages generated by the power converter**	power directional relays
829	How is the direction of rotation of the winch shown in the illustration changed?	interchanging the rotor winding connections M1 and M3 to the brushes	interchanging the stator winding connections T1 and T2 to line	interchanging the stator winding connections T2 and T3 to line	**interchanging the stator winding connections T1 and T3 to line**
830	How is the frequency of an alternator at a given RPM determined?	by the number of turns of wire in the armature coil	**by the number of magnetic poles**	by the strength of the magnets used	by the output voltage
831	How is the frequency output of an operating alternator controlled?	**relative speed of the rotating magnets**	number of turns of wire in the armature coil	strength of the magnets used	output voltage
832	How is the full-load (rated) torque of an induction motor defined?	minimum torque developed by the motor accelerating from rest to the speed at which breakdown torque occurs	**torque developed by the motor operating at rated horsepower, speed, and frequency**	maximum torque developed by an overloaded motor with rated voltage and frequency with appreciable drop in speed	torque developed by the motor at the instant voltage is applied to the motor at startup
833	How is the is the voltage developed by an AC generator controlled?	varying the speed of the prime mover	varying the AC excitation to the field	**varying the DC excitation to the field**	varying the DC excitation of the voltage regulator

ID #	Question	Choice A	Choice B	Choice C	Choice D
834	How is the main propeller shaft rotation of a rectified DC diesel-electric drive normally reversed?	reversing the field polarity in the AC generator	**reversing the field polarity in the DC motor**	reversing the diesel engine rotation	reversing the interpoles
835	How is the main shaft rotation on an AC diesel-electric propulsion vessel normally reversed?	increasing the generator frequency	decreasing the generator frequency	**reversing any two phase leads to the motor**	reversing the prime mover rotation
836	How is the output voltage of a 440 volt, 60 hertz, AC generator controlled?	varying the prime mover speed	**varying the strength of the excitation field**	varying the load on the alternator	varying the number of poles
837	How is the output voltage of a three-phase alternator regulated?	AC voltage to the armature	AC voltage to the field	DC voltage to the armature	**DC voltage to the field**
838	How is the power dissipated as heat in a direct current circuit calculated?	P divided by R	**I squared times R**	E divided by I	I times R divided by T
839	How is the power factor at which paralleled AC generators operate automatically equalized?	characteristics of the connected load	changes in prime mover speed	**changes in field excitation current**	equalization of power factors cannot be achieved automatically
840	How is the power factor of an AC generator operating singularly determined?	**the connected load**	the prime mover speed	the ground current	the generator's rated voltage
841	How is the rated temperature rise of an electric motor defined?	average temperature at any given latitude	**normal temperature rise above the standard ambient temperature at rated load**	average temperature rise due to resistance at 10% overload	permissible difference in the ambient temperature of the motor due to existing weather conditions
842	How is the reversal of an AC, three-phase, induction motor accomplished?	changing all three motor leads	reversing the position of the slip rings	**interchanging any two of the three line leads**	interchanging any two brushes
843	How is the seating the brushes on a DC motor commutator first accomplished?	a file for cutting the approximate curvature followed by sandpaper for the final fit	**using fine sandpaper on a deenergized machine between the brush and the commutator to establish the proper curvature**	emery paper for the initial cut and crocus cloth for the finishing cut	course lapping compound, followed by a medium and then a fine grade
844	How is the speed of a multi-speed squirrel-cage induction motor operating at a constant frequency usually changed?	varying the frequency to the machine	adding resistance in series with the stator windings	adding resistance in parallel with the stator windings	**changing the number of connected poles in the stator**
845	How is the speed of a multi-speed three-phase squirrel-cage induction-type motor operating in a fixed frequency system changed?	changing the number of phases to the motor	**changing the number of stator poles**	changing the locked rotor current	changing the resistance of the rotor winding

ID #	Question	Choice A	Choice B	Choice C	Choice D
846	How is the speed of a multi-speed, squirrel-cage, induction motor operating in a fixed frequency system changed?	**reconnecting stator windings for different numbers of poles**	changing the RPM of the rotor flux	changing the phase sequence of the applied voltage	reconnecting the stator so that no poles have the same polarity
847	How is the speed of a series wound winch motor controlled?	**varying the voltage applied to the motor**	the weight of the load on the cargo boom	overcurrent protection devices in the motor	a hydraulic speed-limiting governor
848	How is the speed of a squirrel-cage induction motor determined?	diameter of the stator	**number of stator poles**	rotor winding resistance	rotor conducting bars resistance
849	How is the speed of a squirrel-cage, multi-speed, induction motor, as used aboard ship, typically changed?	**changing the number of connected poles in the stator**	changing the frequency to the motor	changing the excitation voltage	changing the resistance of the rotor circuit
850	How is the speed of a synchronous motor varied?	interchanging any two of the three live leads	changing the voltage of the system	**changing the input frequency**	increasing the field excitation
851	How is the speed of the propeller shaft directly coupled to an AC synchronous drive motor changed when powered by either a dedicated or integrated constant frequency alternator in an AC diesel-electric drive system?	Varying the generator speed	Varying the number of motor poles	Varying the field strength of the generator	**Varying the output frequency of the power converter**
852	How is the speed of the propeller shaft directly coupled to an AC synchronous propulsion motor changed when powered by a variable frequency propulsion alternator in an AC turboelectric drive system?	**varying the turbine speed**	varying the number of motor poles	varying the field strength of the generator	varying the field strength of the motor
853	How many cells are within a twelve volt lead-acid battery?	one cell	three cells	**six cells**	twelve cells
854	How many cells are within in a 24 volt lead-acid battery?	three cells	four cells	six cells	**twelve cells**
855	How many possible states does a binary logic circuit have?	One	**Two**	Three	Four
856	How many volts are necessary to provide a current of 10 amperes to a motor with an impedance of 11 ohms?	21 volts	**110 volts**	220 volts	240 volts
857	How many watts of power is equal to one horsepower?	500 watts	663 watts	**746 watts**	1,000 watts
858	How may chattering of the collector/slip ring brushes on a generator be remedied?	lubricating brush holders	reinsulating the brushes	**cleaning the collector rings with a canvas wiper**	increasing length of pigtail
859	How may propulsion DC motor brush pressures be calculated?	dividing the brush contact area by the spring pressure	subtracting the brush contact area from the spring pressure	**dividing the spring force by the brush contact area**	subtracting the spring pressure from the brush contact area

ID #	Question	Choice A	Choice B	Choice C	Choice D
860	How may temporary repairs to an open DC propulsion armature coil be made, allowing continued operation until permanent repairs can be made?	connecting the coil ends directly to a pair of negative brushes	**disconnecting coil ends, insulating each, and short circuiting the two commutator bars**	grounding the coil ends and short circuiting the commutator bar	removing the sparking brushes
861	How may the unit "hertz" be best described?	coulombs per second	revolutions per second	revolutions per minute	**cycles per second**
862	How must an analog or digital multimeter set up as an milliammeter be connected?	**in series with the load being measured for current**	in parallel with the load being measured for current	in series-parallel with the load being measured for current	in parallel-series with the load being measured for current
863	How should the shunt of a DC ammeter be connected?	**in series with the load and in parallel with the meter movement**	in parallel with the load and in series with the meter movement	in parallel with the load and in parallel with the meter movement	in series with the load and in series with the meter movement
864	How should the shunt used in an ammeter be connected?	**in series with the load and in parallel with the meter movement**	in parallel with the load and in series with the meter movement	in parallel with the load and in parallel with the meter movement	in series with the load and in series with the meter movement
865	How will a molded-case circuit breaker with a thermal trip unit react immediately after it has tripped, as a result of an overloaded motor circuit?	**The breaker cannot be reset to the ON position until the thermal element cools down.**	The breaker handle will lock in the OFF position.	The breaker handle will lock in the TRIPPED position.	The thermal element must be replaced after an overload trip has occurred before it can be restored into service.
866	How will the value of the output frequency change if the load is removed from a turbo generator having a governor speed droop setting of 3%?	It will remain unchanged.	It will decrease by approximately 3%.	It will become variable.	**It will increase.**
867	How would a circuit with a blown fuse be described?	a short circuit	**an open circuit**	a bonded circuit	a grounded circuit
868	How would a DC ammeter designed to directly measure current be connected?	**in series with a circuit**	in parallel with a circuit	with internal shunts only	without regard to polarity
869	How would you increase the frequency of an operating AC generator?	increase the field excitation	decrease the field excitation	increase the number of magnetic poles	**increase the speed of the prime mover**
870	Humming or buzzing of electric contacts is a symptom of what condition?	**low voltage on the operating coil**	power failure to the operating coil	a control circuit ground	a control circuit overload
871	Hysteresis is one cause of electrical power loss associated with electricity generation equipment. What phenomenon results in hysteresis?	arcing at the brushes	pulsating terminal current	**heat generated by magnetic polarity reversals**	excessive field current

ID #	Question	Choice A	Choice B	Choice C	Choice D
872	If a circuit breaker that utilizes built-in, current limiting fuses (CLF's), cannot be closed or reset, what may be the problem? I. A blown current limiting fuse due to a short-circuit condition II. A missing current limiting fuse	I only	II only	**Either I or II**	Neither I nor II
873	If a circuit has resistances of 5, 10, and 20 ohms connected in parallel, what is the combined total resistance of the circuit?	1.5 ohms	**2.9 ohms**	17.5 ohms	35.0 ohms
874	If a D.C. motor fails to start when voltage is appears across both the line terminals of the starter in the motor controller, which of the listed conditions could exist?	A lightly loaded motor	A blown power circuit fuse	A tripped circuit breaker	**A tripped overload relay**
875	If a D.C. motor hums, but does not run when energized, which of the listed conditions could exist?	No load on the motor	Blown fuse or tripped circuit breaker	Tripped overload	**Tight bearings/frozen shaft**
876	If a DC motor has its armature and field connected across a resistor when the motor is disconnected from its power supply, what statement is true?	The motor has the proper connections for across the line starting.	The motor has the proper connections for an automatic strip heater.	The motor is set up for a reversing controller circuit.	**The motor will slow down by the process of dynamic braking.**
877	If a DC motor runs faster than designed, with all other conditions being normal, what could be the possible cause?	**open shunt field coil**	open armature coil	reversed commutating pole	overload
878	If a DC motor runs hot, what would most likely be the cause?	undercut mica condition	low ambient temperature	**clogged ventilation ducts**	an open in the series field
879	If a delicate component must be soldered into a circuit, how can the component be protected from the heat of the soldering process?	operating the soldering gun not more than 60 seconds at a time	**using a thermal shunt heat sink**	pre-oxidizing the leads to be soldered	coating the leads to be soldered with a light oil film
880	If a digital multimeter is set up as shown in figure "A" of the illustration to test a capacitor, what would the display read if the capacitor is functioning properly?	**the ohmic value would initially read very low, but over time the ohmic value would gradually rise to an extremely high value (OL ohms)**	the ohmic value would initially read very high (OL ohms), but over time the ohmic value would gradually drop to an extremely low value	the ohmic value would read very low and remain at that value	the ohmic value would read very high (OL ohms) and remain at that value

ID #	Question	Choice A	Choice B	Choice C	Choice D
881	If a digital multimeter is set up as shown in figure "A" of the illustration to test a capacitor, what would the display read if the capacitor is open circuited?	the ohmic value would initially read very low, but over time the ohmic value would gradually rise to an extremely high value (OL ohms)	the ohmic value would initially read very high (OL ohms), but over time the ohmic value would gradually drop to an extremely low value	the ohmic value would read very low and remain at that value	**the ohmic value would read very high (OL ohms) and remain at that value**
882	If a digital multimeter is set up as shown in figure "A" of the illustration to test a capacitor, what would the display read if the capacitor is shorted?	the ohmic value would initially read very low, but over time the ohmic value would gradually rise to an extremely high value (OL ohms)	the ohmic value would initially read very high (OL ohms), but over time the ohmic value would gradually drop to an extremely low value	**the ohmic value would read very low and remain at that value**	the ohmic value would read very high (OL ohms) and remain at that value
883	If a digital multimeter is set up as shown in figure "A" of the illustration to test an AC contactor coil, what would the display read if the coil is functioning properly?	0.03 ohms	**22 ohms**	110 V	OL ohms
884	If a digital multimeter is set up as shown in figure "A" of the illustration to test an AC contactor coil, what would the display read if the coil is open-circuited?	0.03 ohms	22 ohms	110 V	**OL ohms**
885	If a digital multimeter is set up as shown in figure "A" of the illustration, what would be displayed on the screen if the fuse being tested is blown?	OL volts	0.001 ohms	470 ohms	**OL ohms**
886	If a digital multimeter is set up as shown in figure "A" of the illustration, what would be displayed on the screen if the fuse being tested is not blown and has proper continuity?	OL volts	**0.001 ohms**	470 ohms	OL ohms
887	If a digital multimeter is set up as shown in figure "B" of the illustration to test a capacitor, what would the display read if the capacitor was functioning properly?	the charging voltage would be displayed which will initially be low and gradually rise to the internal battery voltage	**the actual capacitance value of the capacitor will be displayed which should be within the tolerance range of the capacitor**	initially a very low ohmic value will be displayed, followed by a gradual rise in resistance until a very high value is displayed (OL ohms)	initially a very high ohmic value will be displayed (OL ohms), followed by a gradual drop in resistance until a very low value is displayed
888	If a digital multimeter is set up as shown in figure "B" of the illustration to test an AC solenoid valve coil, what would the display read if the coil is functioning properly?	0.03 ohms	**110 ohms**	110 V	OL ohms

ID #	Question	Choice A	Choice B	Choice C	Choice D
889	If a digital multimeter is set up as shown in figure "B" of the illustration to test an AC solenoid valve coil, what would the display read if the coil is open-circuited?	0.03 ohms	110 ohms	110 V	**OL ohms**
890	If a digital multimeter is set up as shown in figure "B" of the illustration to test an AC solenoid valve coil, what would the display read if the coil is short-circuited?	**0.03 ohms**	110 ohms	110 V	OL ohms
891	If a digital multimeter is set up as shown in figure "B" of the illustration, what would be displayed on the screen if the single pole, single throw switch being tested is in the "off" position, and the internal switch contacts have no continuity?	OL volts	0.001 ohms	470 ohms	**OL ohms**
892	If a digital multimeter is set up as shown in figure "B" of the illustration, what would be displayed on the screen if the single pole, single throw switch being tested is in the "off" position, but the internal switch contacts are welded together?	OL volts	**0.001 ohms**	470 ohms	OL ohms
893	If a digital multimeter is set up as shown in figure "B" of the illustration, what would be displayed on the screen if the single pole, single throw switch being tested is in the "on" position and the internal switch contacts are closed and have proper continuity?	OL volts	**0.001 ohms**	470 ohms	OL ohms
894	If a digital multimeter is set up as shown in figure "B" of the illustration, what would be displayed on the screen if the single pole, single throw switch being tested is in the "on" position, but the internal switch contacts are corroded and have partial continuity?	OL volts	0.001 ohms	**470 ohms**	OL ohms
895	If a digital multimeter is set up as shown in figure "B" of the illustration, what would be displayed on the screen if the single pole, single throw switch being tested is in the "on" position, but the internal switch contacts are deteriorated and have no continuity?	OL volts	0.001 ohms	470 ohms	**OL ohms**
896	If a digital multimeter is set up as shown in figures "A" and "B" of the illustration, what is the status of the silicon diode if the display reads 3.9 ohms when configured as in figure "A" and reads 3.9 ohms when configured as in figure "B"?	**the diode is shorted**	the diode is open	the diode is functioning properly	the diode is intermittently open

ID #	Question	Choice A	Choice B	Choice C	Choice D
897	If a digital multimeter is set up as shown in figures "A" and "B" of the illustration, what is the status of the silicon diode if the display reads 4.7 ohms when configured as in figure "A" and reads 490 ohms when configured as in figure "B"?	the diode is shorted	the diode is open	**the diode is functioning properly**	the diode is intermittently open
898	If a digital multimeter is set up as shown in figures "A" and "B" of the illustration, what is the status of the silicon diode if the display reads OL ohms when configured as in figure "A" and reads OL ohms when configured as in figure "B"?	the diode is shorted	**the diode is open**	the diode is functioning properly	the diode is intermittently open
899	If a digital multimeter is set up as shown in figures "A" and "B" to test a silicon diode, what is the status of the diode if the screen displays 0.000 V when configured as in figure "A" and displays 0.000 V when configured as in figure "B"?	**diode is shorted**	diode is operating properly	diode is open	diode is intermittently open
900	If a digital multimeter is set up as shown in figures "A" and "B" to test a silicon diode, what is the status of the diode if the screen displays 0.70 V when configured as in figure "A" and displays OL V when configured as in figure "B"?	diode is shorted	**diode is operating properly**	diode is open	diode is intermittently open
901	If a digital multimeter is set up as shown in figures "A" and "B" to test a silicon diode, what is the status of the diode if the screen displays OL V when configured as in figure "A" and displays OL V when configured as in figure "B"?	diode is shorted	diode is operating properly	**diode is open**	diode is intermittently open
902	If a digital multimeter set up to measure AC volts reads slightly above 'zero' when its leads are disconnected, what is this a result of?	definite miscalibration of the meter	a poor ground for the meter case	**'ghost' voltages due to electromagnetic energy in the air**	capacitors inside the meter storing charges
903	If a frequency of 16.8 kHz were measured at the output of 'FF-3' of the circuit shown in the illustration, what would be the input clock frequency at 'FF-0'?	**1.050 MHz**	525 kHz	262.5 kHz	131.25 kHz
904	If a frequency of 2.5 kHz were measured at the output of 'FF-3' in the circuit shown in the illustration, what would be the input clock frequency at 'FF-0"?	5 kHz	10 kHz	20 kHz	**40 kHz**
905	If a fuse of correct size and type blows frequently, what should be done?	try the next higher amperage rating	try the next lower amperage rating	**look for trouble within the circuit**	reduce the applied voltage 10%
906	If a magnetic controller contact fails to pick up when the operating coil is energized, what could be one possible cause?	low spring pressure	**low applied voltage to the coil**	the residual magnetism of the contact faces	dirty contact faces

ID #	Question	Choice A	Choice B	Choice C	Choice D
907	If a magnetic controller contactor fails to pick up when the coil voltage is applied to the contactor coil, what would likely be the cause?	overload	misalignment of the affected contactor contacts	low spring pressure	**an open contactor coil**
908	If a magnetic controller relay fails to drop out when the coil voltage is removed from the relay, what is the probable cause?	excessive spring tension	overvoltage	excessive current	**welded contacts**
909	If a modern brushless alternator is to be inactive for an extended period of time, which of the following actions should be taken?	It should be disconnected from the prime mover and raised off its bearing supports.	Insulation resistance readings should be taken weekly to ensure resistance is not deteriorating.	**The disconnect switch or links should be opened and the space heater energized.**	The disconnect switch or links should be closed and the space heater de-energized.
910	If a shipboard AC generator experiences a failure to produce a voltage, what may be the cause?	**an open in the rotor field circuit**	the brushes shifting out of the neutral plane	excessive locked-rotor current	a rotating slip ring
911	If a short circuit in the armature of a DC motor occurs what would be the result?	run fast	hum when energized	**spark at the brushes**	fail to start
912	If a single-phase capacitor start induction motor fails to start, but instead hums without starting, what is most likely to be the problem?	**an open start capacitor**	a tripped circuit breaker	a shorted centrifugal switch	a blown fuse
913	If a small electric motor has been immersed in salt water, what should be done? I. Thoroughly rinsed in fresh water and completely dried II. initially started with reduced voltage	**I only**	II only	both I and II	neither I or II
914	If a small electric motor has been submerged in saltwater for a short period of time, what should be done?	send it ashore for rewinding	**rinse it with warm freshwater and bake it dry in an oven**	soak it in a bucket of commercial solvent and bake with internal heat	clean it with carbon tetrachloride and blow it out with compressed air
915	If a small electric motor is immersed in salt water, in addition to tending to bearing lubrication issues, what should be done prior to placing it back into operation? I. washed in fresh water II. dried in an oven	I only	II only	**both I and II**	neither I or II
916	If a small electric motor is immersed in salt water, what should be done in an attempt to salvage the motor? I. washed in fresh water II. thoroughly dried	I only	II only	**both I and II**	neither I or II

ID #	Question	Choice A	Choice B	Choice C	Choice D
917	If a solid-state circuit is inoperative; what should be the FIRST action taken?	wiggle all the components to check for loose connections	check all the resistors	change all transistors	**check the DC supply voltage**
918	If a synchronous motor begins to vibrate severely and pull out of synchronism, what would most likely be the cause? I. a mechanical overload II. Insufficient excitation current	I only	II only	**Either I or II**	Neither I nor II
919	If a three-phase induction motor is operated under a light load and it develops an open in one of its supply lines, what will be the result?	**the motor continue to run, but will vibrate and have reduced torque**	the motor will speed up due to the reduced number of poles	the motor will run cooler due to reduced current flow	the motor will stop
920	If a three-phase induction motor malfunctions and drops to a single-phase (one supply line open), what would be the result?	**the motor will continue to run if it is not heavily loaded**	more torque will be developed	the motor will immediately stop and not be able to be restarted	the motor will immediately stop and can only be restarted at no load
921	If a three-phase motor controlled by the control circuit illustrated in figure "B" of the illustration, is running in the forward direction, which of the following sequences must occur before the motor will reverse rotation?	**First, the motor must be stopped via the stop button, then normally closed 'F' contacts must re-close, and finally the reverse start button must be depressed.**	First, the motor must be stopped via the stop button, then normally closed 'F' contacts must re-open, and finally the reverse start button must be depressed.	First, the motor must be stopped via the stop button, then normally open 'F' contacts must re-close, and finally the reverse start button must be depressed.	First, the motor must be stopped via the stop button, then normally open 'F' contacts must re-open, and finally the reverse start button must be depressed.
922	If all of the ground detection lamps burn with equal brilliance, whether the test button is depressed or released, what does this indicate?	**no ground-faults exist**	a ground-fault exists in all phases	a dead ground-fault exists	a high impedance ground-fault exists
923	If all three ground-detection lamps continue to burn at equal intensity after the test button is depressed and released, which of the listed conditions is indicated?	**No grounds exist**	All three phases are grounded	The test switch is faulty	The current transformers are shorted out
924	If an electric motor fails to start, what should you check FIRST?	phase sequence	motor winding resistances	**fuses or circuit breaker as applicable**	line frequency
925	If an induction motor were to be operated at 90% rated voltage and at rated load, what would be the result?	there would be an increase in starting torque	starting current would increase slightly	synchronous speed would decrease slightly	**running current would increase and the motor would run hotter**

ID #	Question	Choice A	Choice B	Choice C	Choice D
926	If an unloaded DC compound motor's shunt field were weakened by excessive rheostat resistance or by an open circuit, how would the motor respond?	**overspeed due to reduced CEMF**	stop because of low flux	continue to run at base speed	slow down and overheat
927	If both the 'high level' and 'low level' alarms come on for the same address of a centralized control console, what is the most likely failure?	**sensor failure**	failed alarm	low level	extremely high level
928	If coil 'R1-R2-R3' at the receiver of figure "A" shown in the illustration were in 180 degree error with respect to that of the transmitter of figure "B", using figure "C" as a guide, what corrective action should be taken?	No action is necessary as this is proper operation.	Interchange connections 'R1' and 'R2'.	**Interchange connections 'S1' and 'S2'.**	Interchange connections 'S1' and 'S3'.
929	If coil 'R1-R2-R3' on the transmitter in figure "C" shown in the illustration is turned 30 degrees clockwise, how will the corresponding coils 'R1-R2-R3' on the receivers (indicators) respond?	receive a lower voltage depending on the turns ratio	ring at the receiving station until the turning stops	receive a higher voltage depending on the turns ratio	**torque will cause them to align to the same position**
930	If coils 'R1-R2-R3' at the receiver of figure "C" shown in the illustration turned opposite of those in the transmitter, what action should be taken to have both turn in the same direction?	Reverse the 60 Hz supply connections to 'S1' and 'S2'.	Interchange leads 'S1' and 'R2'.	Interchange leads 'S2' and 'R3'.	**Interchange leads 'R1' and 'R3'.**
931	If deck machinery is expected to be idle for an extended period of time, what should be done?	have electrical safety gloves available in case of electrical shock before running	perform a 'high pot' test to determine the condition of the insulation	water wash the motor and controller to remove any salt that may interfere with smooth operation	**energize space heaters to prevent the condensation of moisture**
932	If field excitation is suddenly lost to an alternator operating in parallel with another alternator, what will happen to the alternator that has experienced a loss of field excitation?	It will supply excessive current to the bus.	It will operate at the same load, but with reduced voltage.	**It will lose its load and tend to overspeed.**	It will become overloaded and slow down.
933	If it is required that the coils 'R1-R2-R3' in the indicator of figure "A", turn opposite to those in the transmitter, as shown in the illustration, what action should be taken?	Reverse the 60 Hz supply connections to 'S1' and 'S2'.	No action is needed.	**Interchange leads 'R1' and 'R3'.**	Interchange leads 'R2' and 'R3'.
934	If many turns of an alternating current coil for a contactor become short circuited, what will happen to the coil?	it will have a higher resistance value	**it will probably burn out immediately**	it will operate on reduced current	it will experience a temperature will drop
935	If many turns of an operating coil of an AC contactor become short circuited, in terms of the coil, what is the likely result?	the coil temperature will drop	**the coil will probably burn out immediately**	the coil will continue to operate	the coil will operate on reduced current
936	If overloading an electric motor becomes necessary in an emergency situation, what should be done to prevent damage to the motor while allowing sustained operation?	**cool the motor with portable blowers and fans**	hold thermal overload relays open with blocks of wood	inject small amounts of CO2 into the windings for cooling	increase the residual magnetism value of windings to reduce eddy currents

ID #	Question	Choice A	Choice B	Choice C	Choice D
937	If power were lost to the hoist controller shown in the illustration while in 'second point hoist' the winch would stop. When power is restored, how would the winch respond?	it would continue to run at 'second point hoist' unless a different speed is selected by the 'master switch'	it would continue to run but at 'first point' speed, for safety, until the 'master switch' is brought to 'off' and then back to the desired speed	it would remain stopped until the 'OL' reset contacts are reclosed then continue to run it 'second point hoist'	**it would remain stopped until the 'master switch' is returned to 'off' closing the 'MS 1' contacts and then safely moved to any 'run' position**
938	If rotor-to-stator air gap readings for an electrical generating machine have changed significantly from the last reading, what should be checked?	**the generator bearings for wear**	insulation readings and machine cleanliness	the prime mover thrust bearing for wear	the field coil bolts for the proper torque values
939	If the approximate voltage to be measured in an electric circuit is not known, what should be done?	use the lowest voltage range on the voltmeter	connect the meter in series with the circuit	only have to calibrate the meter before using it	**use the highest voltage range on the voltmeter**
940	If the centrifugal switch or relay used for cutting out the starting winding of a split-phase induction motor fails to open once the motor is in operation, what will be the result?	the motor will overspeed	**the starting winding will burn out**	the motor will immediately stall under load	the motor torque will be above normal at rated speed
941	If the circuit shown in the illustration were energized and operating properly, which of the devices listed would be open?	The stop push-button	**The start push-button**	Auxiliary contact 'M'	Contact 'OL'
942	If the clock frequency input to the circuit shown in the illustration were 2 kHz, what would be indicated at the output of 'FF-3' at the Q3 output?	**125 Hz**	250 Hz	500 Hz	1 kHz
943	If the clock input frequency to the circuit shown in the illustration were 100 kHz, what would be indicated at the output of 'FF-3'?	50 kHz	25 kHz	12.5 kHz	**6.25 kHz**
944	If the connections for the field and armature leads on a DC motor are both reversed, what will be the result?	the motor will run as a generator	the motor will not run	**the direction of rotation will be the same**	the direction of rotation will be reversed
945	If the contacts of a motor starter or controller fail to drop out when the 'stop' button is depressed, what could be the cause?	stop contacts are carrying insufficient current	**stop contacts have become welded together**	starter shading coil is broken	starter shading coil is loose
946	If the cooling water system is isolated for repairs, but it is still desirable to run the alternator pictured in figure "A" of the illustration, what must be done?	**The emergency air inlet panel and air outlet doors must be opened and only then can the alternator be run, but at reduced load.**	The emergency air inlet panel and air outlet doors must be opened, but in doing so allows the alternator to be run at rated load.	The emergency air inlet panel and air outlet doors must remain closed, which requires the alternator to be run only at reduced loads.	The alternator may not be run without cooling water under any circumstances.

ID #	Question	Choice A	Choice B	Choice C	Choice D
947	If the driving torque, such as that produced by a diesel engine, creates pulsations when coupled with a synchronous generator operating in parallel, the generator rotor may be periodically pulled ahead or behind its normal position as it rotates. How can this condition called hunting be reduced?	**by the use of amortisseur windings**	by direct coupling	by increasing governor speed droop	by decreasing governor speed droop
948	If the energy input is significantly reduced to the prime mover of one shipboard alternator operating in parallel with others, what will happen to that alternator?	continue to operate at no load	lose its load and overspeed	**begin to motorize and then trip out**	slow down and operate at reduced load
949	If the excitation of an alternator operating in parallel is decreased below normal and the other above normal, what will be the result on the alternator with the excitation decreased below normal?	power factor will change in the lagging direction	**power factor will change in the leading direction**	ampere load will be greatly increased	kilowatt load will be greatly decreased
950	If the field current of a paralleled AC generator is increased above normal, what will be the net result to the VAR's and power factor?	**VAR's will increase and the power factor will be more lagging**	VAR's will increase and the power factor will be more leading	VAR's will decrease and the power factor will be more lagging	VAR's will decrease and the power factor will be more leading
951	If the field current of a paralleled AC generator is increased above normal, what will be the net result to the VAR's and power factor?	VAR's will increase and the power factor will be more leading	**VAR's will increase and the power factor will be more lagging**	VAR's will decrease and the power factor will be more lagging	VAR's will decrease and the power factor will be more leading
952	If the field current of a paralleled AC generator is increased above normal, what will be the net result to the VAR's and power factor?	VAR's will decrease and the power factor will be more leading	VAR's will increase and the power factor will be more leading	VAR's will decrease and the power factor will be more lagging	**VAR's will increase and the power factor will be more lagging**
953	If the field excitation is increased to one of two alternators operating in parallel and decreased on the other, what will be the result on the alternator with the field excitation increased?	**the power factor will change in the lagging direction**	the power factor will change in the leading direction	the kilowatt load will be greatly increased	the ampere load will be greatly decreased
954	If the illustrated device in figure "B" has a step-up ratio of 10 to 1 what voltage would be measured at the secondary shortly after the primary of the device is connected to 110 volts DC with a current of 12 amps?	**0 volts**	110 volts	1000 volts	1100 volts
955	If the illustrated device is fully charged, what will be the result?	The specific gravity will be at a maximum value and the output voltage will be at a maximum value.	**The specific gravity will be unchanged and the output voltage will be at a maximum value.**	The specific gravity will be at a maximum value and the output voltage will remain unchanged.	The specific gravity and the output voltage will remain unchanged.

ID #	Question	Choice A	Choice B	Choice C	Choice D
956	If the illustrated SR bistable latch function block PLC ladder diagram represents a subroutine used for a fire alarm system, which statement is true?	**Inputs "1", "2", and "3" represent fire/smoke detectors or hand pull reporting stations and Input "4" represents an alarm acknowledgement switch.**	Inputs "1", "2", "3" represent fire/smoke detectors and Input "4" represents a hand pull reporting station.	Input "4" represents a fire/smoke detector and Inputs "1", "2", "3" represent hand pull reporting stations.	Inputs "1", "2", and "3" represent alarm acknowledgement station switches stations and Input "4" represents a fire/smoke detector or hand pull reporting station. .
957	If the inputs to the diagram shown in figure "2" of the illustration were A=0 and B=0, what logic levels would be indicated at points "C", "D", "E", and "F" respectively?	**C=1, D=1, E=0, and F=1**	C=1, D=0, E=1, and F=0	C=1, D=0, E=0, and F=1	C=0, D=0, E=1,and F=1
958	If the inputs to the diagram shown in figure "2" of the illustration were A=0 and B=1, what logic levels would be indicated at points "C", "D", "E", and "F" respectively?	C=1, D=1, E=0, and F=1	**C=1, D=0, E=1, and F=0**	C=1, D=0, E=0, and F=1	C=0, D=0, E=1,and F=1
959	If the inputs to the diagram shown in figure "2" of the illustration were A=1 and B=0, what logic levels would be indicated at points "C", "D", "E", and "F" respectively?	C=1, D=1, E=0, and F=1	**C=1, D=0, E=1, and F=0**	C=1, D=0, E=0, and F=1	C=0, D=0, E=1,and F=1
960	If the inputs to the diagram shown in figure "2" of the illustration were A=1 and B=1, what logic levels would be indicated at points "C", "D", "E", and "F" respectively?	C=1, D=1, E=0, and F=1	C=1, D=0, E=1, and F=0	C=1, D=0, E=0, and F=1	**C=0, D=0, E=1,and F=1**
961	If the length of a wire is halved and the cross-sectional area is doubled, what will be the resistance of the wire as compared to the original wire?	**quartered**	unchanged	doubled	quadrupled
962	If the line voltage to the controller shown in the illustration is 440 volts, what voltage is applied across the motor when contacts "KM2" close, assuming that the U2, V2, and W2 connections are made at the 50% tap of the autotransformer?	110 volts	**220 volts**	440 volts	660 volts
963	If the line voltage to the controller shown in the illustration is 440 volts, what is applied across the control circuit assuming the control transformer has a 4:1 turns ratio?	**110 volts**	220 volts	440 volts	660 volts
964	If the motor of the illustrated circuit fails to start and gives a loud hum when the start button is pushed, what is most likely the problem?	**an open overload "OL" heater**	the disconnect switch "DS" is open	an open overload "OL" relay contact	an open main contactor "M" coil

ID #	Question	Choice A	Choice B	Choice C	Choice D
965	If the motor shown in the illustration will not start when the "off-run" switch is placed in the run position, which of the listed components should be checked FIRST?	**check the overload relay for tripped condition, reset as necessary**	check the disconnect switch open, open as necessary	check the main contactor coil for continuity, replace as necessary	check the overload relay (OL) heaters for continuity, replace as necessary
966	If the pointer fails to return to zero when a hand-cranked megger is disconnected, what does this indicate?	pointer is stuck	hair springs are burned out	megger is out of calibration	**megger is operating normally**
967	If the primary winding of a voltage transformer is connected to a steady DC source, self-inductance and mutual inductance is not possible. As a result, what part of the transformer will result in current overload?	contacts	**primary coil**	secondary coil	core
968	If the resistance of a circuit is one half the original value and the applied voltage is kept constant, what will be the effect on the current as compared to the original current?	**doubled**	quadrupled	unchanged	cut in half
969	If the supply voltage is 220 volts 60 Hz, what is the operating voltage of the motor controller control circuit illustrated in figure A of the illustration?	110 volts DC	110 volts AC	220 volts DC	**220 volts AC**
970	If the synchronous speed of a 12 pole, polyphase, induction motor operating at 60 Hz were 600 RPM, how many poles will be required in a similar motor operating at the same frequency but having a synchronous speed of 900 RPM?	4	6	**8**	18
971	If the values of "C1" and "R1" shown in the illustration were 1 microfarad and 3 megohms respectively, at what listed time would "C1" be considered fully charged?	0.33 second	3 seconds	6 seconds	**15 seconds**
972	If the values of "C1" and "R1" shown in the illustration were 1 microfarad and 100 k ohms respectively, at what listed time would "C" be considered fully charged?	0.1 second	0.2 second	**0.5 second**	5 seconds
973	If the values of "C1" and "R1" shown in the illustration were 1 microfarad and 100 k ohms, which of the listed time intervals would equal one 'time constant'?	**0.1 second**	0.2 second	0.5 second	5.0 seconds
974	If the values of C1 and R1 shown in the illustration were 1 microfarad and 3 megohms respectively, which of the listed intervals of time would equal one 'time constant'?	0.33 second	**3 seconds**	6 seconds	15 seconds

ID #	Question	Choice A	Choice B	Choice C	Choice D
975	If the voltage and the current developed in an AC circuit reach their peak values at the same time (with a phase angle difference of zero), what is the power factor considered to be?	lagging	leading	**unity (1.0)**	infinity
976	If the voltage supplied to the lighting circuit is 110 volts, how much current is drawn by a 100 watt light bulb?	0.08 amps	**0.91 amps**	1.10 amps	90.9 amps
977	If two AC generators have just been placed in parallel manually, how is the kilowatt load is initially distributed evenly?	a balance coil	changing field excitation	**adjusting the governor control settings**	a rheostat
978	If two alternators are operating in parallel, what will change if each alternator's field excitation is changed in opposite directions (one alternator's field current increasing, while the other is decreasing)?	alternator frequency	phase sequence	**reactive power division**	active power division
979	If you disconnect and arrange both ends of a conductor of a multi-conductor cable without any contact between the individual conductors, what would a low ohmic value between the ends of a single conductor indicate?	**continuity of the conductor**	an infinite resistance	the presence of a partial ground	that the conductor is not short circuited
980	If you hear a loud buzzing noise coming from a magnetic motor controller, what should you do?	assume that the motor is operating at a full load	assume that the controller is operating normally	**notify the electrician or watch engineer of the problem**	feel the outside of the casing with your hand to see if it is hot
981	If your multimeter set up to measure resistance gives a very low resistance reading in ohms when testing from opposite ends of each conductor of a three-conductor cable, what does this indicate?	**continuity of the conductor**	an infinite resistance	the presence of a partial ground	that the conductor is not short circuited
982	Impressed current cathodic hull protection systems are commonly used on modern vessels. What are these systems designed to replace or reduce?	electroplating of the hull	repeated painting of the hull	**sacrificial zinc anodes**	vacuum tube degaussing systems
983	In a 15 HP induction-type motor with a squirrel-cage rotor, compared to the full load current at rated speed, how much starting current is required at standstill to produce successful starting torque?	half the full load current	equal to the full load current	**five times the full load current**	ten to twenty times the full load current
984	In a 60 Hz AC system, what is the duration in seconds for one complete cycle?	60 seconds	6 seconds	1 second	**.016 of a second**
985	In a basic AC induction motor, by what means are rotor currents induced in the rotor?	a bridge rectifier	an armature and brushes	**magnetically by the rotating stator field**	external variable resistors

ID #	Question	Choice A	Choice B	Choice C	Choice D
986	In a circuit with DC voltage applied to resistances connected in series and the switch closed, under what circumstance would the full applied voltage be measured across one resistor?	the resistor next to the negative terminal	a resistor that has become short circuited	the resistor next to the positive terminal	**a resistor that has become open circuited**
987	In a conventional AC generator utilizing brushes, direct current from the exciter output is passed through the windings of the main field rotor by what means?	**by means of slip rings**	by means of a commutator	by means of rotating bar magnet	to minimize the danger of arc over
988	In a diesel electric plant, raising the generator's field excitation current will have what effect on the DC propulsion motor speed?	**increase in speed**	decrease in speed	affect generator speed only	affect main motor speed if done in conjunction with higher generator engine speeds
989	In a dual element time-delay cartridge-type fuse, what type of protection is provided for motor applications?	short-circuit protection using a fusible link only	sustained overload protection using a spring loaded soldered joint only	short-circuit protection using a spring loaded soldered joint AND sustained overload protection using a fusible link	**short-circuit protection using a fusible link AND sustained overload protection using a spring loaded soldered joint**
990	In a logic circuit, how does a NOT gate function?	it does not alter the input logic condition	it serves to amplify a given signal level	it serves to attenuate a given signal level	**it reverses the input logic condition**
991	In a logic circuit, what statement is true concerning how the NOR and NAND logic gates function?	Both the NOR and NAND logic gates must be used together in a logic circuit and cannot be used individually.	Given the same inputs, the NOR and NAND logic gates are the opposite of each other in terms of outputs.	**Given the same inputs, the NOR logic gate has the opposite output from the OR logic gate and similarly the NAND logic gate has the opposite output from the AND logic gate.**	The NOR and NAND logic gates can be used interchangeably.
992	In a rectified DC diesel electric plant, raising the AC generator's field excitation current will have what effect on the DC propulsion motor?	**increase in speed**	decrease in speed	operate with a lower power factor	operate with a higher power factor
993	In a series circuit what is the total applied voltage equal to?	**the sum of the individual voltage drops**	the total resistance divided by the total current	the sum of the individual currents multiplied by the number of resistors	the total current divided by the total resistance
994	In a series circuit, which value will remain unchanged at all places in the circuit?	Voltage	**Current**	Resistance	Inductance
995	In a series wound motor, the current passing through the field windings also passes through what component?	**armature**	shunt field	reactance comparator	laminations

ID #	Question	Choice A	Choice B	Choice C	Choice D
996	In a short-shunt cumulatively compound-wound DC motor, how is the shunt field connected?	**in parallel with the armature**	in parallel with the armature and series field	in series with the armature	in series with the armature and series field
997	In a shunt-wound DC generator, with what generator component are the shunt field windings connected in parallel with?	the interpoles	**the armature circuit**	the compensating windings	the series field winding
998	In a simple DC circuit, the resistance is held constant while the applied voltage is halved. What will be the effect on the current flow as compared to the original current?	double	remain the same	**be divided by two**	be divided by four
999	In a single element cartridge-type fuse, what type of protection is provided for lighting and general power applications?	sustained overload protection using a fusible link	sustained overload protection using a spring loaded soldered joint	**short-circuit protection using a fusible link**	short-circuit protection using a spring loaded soldered joint
1000	In a three-phase circuit, how far apart are the phase voltages?	**120° apart**	160° apart	180° apart	360° apart
1001	In a three-phase electrical system, three ground detecting lamps are provided. If all three lamps REMAIN at half-brilliance when the ground detecting test switch is operated, what does this indicate?	there is a slight ground on all three phases	the switch must be replaced	**there are no grounds present**	the light bulbs are of improper voltage
1002	In a three-phase electrical system, three ground detecting lamps are provided. One lamp goes dark and the others increase in brightness when the "ground test" button is pushed. What is indicated?	**there is a ground on the line with the dark lamp**	the dark lamp must be replaced	there are grounds on the lines with the bright lamps	this is a normal condition
1003	In a three-phase, squirrel-cage type, induction motor, how is the primary rotating magnetic field established?	current induced in the rotor windings	**application of a three-phase voltage supply to the stator windings**	laminated steel core and aluminum conductors in the rotor	interaction of the magnetic field caused by the induced current in the squirrel-cage bars with the magnetic field of the stator
1004	In a three-phase, wye-wye connected transformer, what is the relationship between line current and phase current?	**the line current is equal to the phase current**	the line current is three times the phase current	the line current is equal to the sum of any two phase currents	the line current is equal to the difference of any two phase currents

ID #	Question	Choice A	Choice B	Choice C	Choice D
1005	In accordance with 46 CFR, Subchapter J (Electrical Engineering), a motor fitted with a heater to prevent condensation within the motor when the motor is idle must have a separate source of power and means of disconnect from the motor itself. Additionally a sign is required to warn the operator to open both devices before servicing. Where would you expect to find the heater disconnect device?	at the motor itself	**adjacent to the motor disconnect device**	in the engine control room	there are no specific requirements
1006	In accordance with 46 CFR, Subchapter J (Electrical Engineering), each diesel engine driven generator prime mover must have an overspeed device, independent of the normal operating governor. If in testing the overspeed device, what should be the trip point setting in terms of rated speed?	not to exceed 10% above rated speed	**not to exceed 15% above rated speed**	not to exceed 20% above rated speed	not to exceed 25% above rated speed
1007	In accordance with 46 CFR, Subchapter J (Electrical Engineering), panel boards are required to be numbered and have a circuit directory. What information is required for each circuit in the directory?	circuit designation and load description only	load description and overcurrent device rating or setting only	circuit designation and overcurrent device rating or setting only	**circuit designation, load description, and overcurrent device rating or setting**
1008	In actual applications, electrical connections associated with 'R1, R2 and R3' of the transmitter to 'R1, R2, and R3' of the indicators shown in figure "C" of the illustration are made by what means?	soldered contacts	spliced and taped connections	**slip rings and brushes**	solderless crimp-on connectors
1009	In addition to frequency, how is the speed of a squirrel cage induction motor determined?	diameter of the stator	**number of stator poles**	rotor winding resistance	bar resistance of the conducting rotor
1010	In addition to improper brush pressure or seating, what can result in excessive sparking at the brushes of a DC propulsion motor?	**improper positioning of brush rigging outside the neutral plane**	reversed armature polarity with respect to the field	reversed main field polarity with respect to the armature	operating at continuously varying loads such as during maneuvering
1011	In addition to short circuits and sustained overloads, in what other situation are fuses likely to blow?	**loose fuse holder clips**	low ambient temperatures	low fuse holder clip to fuse contact resistance	oversized fuses in terms of amp rating
1012	In addition to tending to bearing lubrication issues, if a small electric motor is immersed in salt water, what should be done before placing it back into operation? I. washed in fresh water and thoroughly dried II. initially started with reduced voltage	**I only**	II only	both I and II	neither I or II

ID #	Question	Choice A	Choice B	Choice C	Choice D
1013	In addition to testing the calibration of a circuit breaker, what additional maintenance should be routinely performed?	changing out of magnetic elements yearly as appropriate	changing out of bimetallic elements yearly as appropriate	**performing an external visual inspection**	complete disassembly to perform an internal inspection
1014	In an alternating current circuit, what factor of a circuit will cause the inductive reactance to vary?	resistance of the circuit	**frequency of the circuit**	voltage of the circuit	current of the circuit
1015	In an impressed current cathodic protection system, concerning the anodes associated with the hull, what statement is true?	The anodes are connected to the hull and waste away with time.	**The anodes are insulated from the hull and do not waste away with time.**	The anodes are connected to the hull and do not waste away with time.	The anodes are insulated from the hull and waste away with time.
1016	In an inductive-resistive circuit, what is the unit of measure for power associated with just the inductive aspects of the load?	kilovoltamps (kVA)	**kilovoltampsreactive (kVAR)**	kilovolts (kV)	kilowatts (kW)
1017	In an ungrounded distribution system, as compared to a normal indication, what is the indication on a switchboard of a current carrying conductor making an accidental electrical contact with a wiring metal conduit?	lower switchboard wattmeter reading than normal	reading of 1.0 on the power factor meter	higher switchboard voltmeter reading than normal	**totally darkened switchboard ground-detecting light**
1018	In analyzing the current waveforms as depicted in figure "B" of the illustration, what is responsible for producing the line current waveform?	the effect of the first, second, third, fourth, fifth, sixth, and seventh harmonic frequency currents	the effect of the second, fourth, and sixth harmonic frequency currents	**the effect of the fundamental, third, fifth, and seventh harmonic frequency currents**	the effect of the third, fifth, and seventh harmonic frequency currents
1019	In comparing a semiconductor diode to a vacuum tube diode, what statement is true?	The semiconductor diode has shorter life, no warm-up time, and is less delicate than the vacuum tube diode.	The semiconductor diode has longer life, no warm-up time, and is more delicate than the vacuum tube diode.	**The semiconductor diode has longer life, no warm-up time, and is less delicate than the vacuum tube diode.**	The semiconductor diode has longer life, longer warm-up time and is less delicate than the vacuum tube diode.
1020	In comparing a semiconductor diode to a vacuum tube diode, which statement is true?	The semiconductor diode is smaller in size, has no warm-up time, and is less reliable than the vacuum tube diode.	The semiconductor diode is smaller in size, has significant warm-up time and is more reliable than the vacuum tube diode.	The semiconductor diode is larger in size, has no warm-up time and is more reliable than the vacuum tube diode.	**The semiconductor diode is smaller in size, has no warm-up time and is more reliable than the vacuum tube diode.**
1021	In comparing the composite waveforms as shown in figures "C" and "D", what are the essential differences?	**The AC components are identical and the DC components are equal but of opposite polarity.**	The AC components have a different peak-to-peak voltage and the DC components are identical.	The AC components are identical and the DC components are identical.	The AC components have a different peak-to-peak voltage and the DC components are equal but of opposite polarity.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1022	In comparison to a main switchboard for a DC electrical distribution system, a main switchboard for an AC electrical distribution system requires the use of which of the following devices, whereas a DC main switchboard does not?	Reverse power or current relays	Generator and load center circuit breakers	**Frequency meter, power factor or reactive power meters, and synchronizing lamps or synchroscope**	Voltage regulator and prime mover governor speed controls
1023	In conducting a megger test as shown in figure "A" of the illustration, a ground is detected. For testing purposes, how can the motor feeder cable itself be eliminated or confirmed as the source of the ground?	Disconnect the motor feeder cable leads at the motor and perform the megger test again at the disconnected motor feeder cable leads.	Disconnect the motor feeder cable leads at the motor starter and perform the megger test again at the disconnected motor feeder cable leads.	**Disconnect the motor feeder cable leads at both ends and perform the megger test again at either end of the motor feeder cable leads.**	Disconnect the motor feeder cable leads from the starter and perform the megger test again at the T1, T2, and T3 terminals of the motor starter. .
1024	In conducting a megger test as shown in figure "A" of the illustration, a ground is detected. For testing purposes, how can the motor itself be eliminated or confirmed as the source of the ground?	Disconnect the motor feeder cable leads at the motor and perform the megger test again at the disconnected motor feeder cable leads.	Disconnect the motor feeder cable leads at the motor starter and perform the megger test again at the disconnected motor feeder cable leads.	Disconnect the motor feeder cable leads at both ends and perform the megger test again at either end of the motor feeder cable leads.	**Disconnect the motor feeder cable leads from the motor itself and perform the megger test again as shown in figure "B".**
1025	In considering the status of the synchroscope pointer as shown in figure "B" of the illustration, at what point should the circuit breaker for the incoming machine be closed if paralleling manually?	Just before the 6:00 position, with the pointer rotating very rapidly in the fast direction.	**Just before the 12:00 position, with the pointer rotating very slowly in the fast direction.**	Just before the 6:00 position, with the pointer rotating very slowly in the fast direction.	Just before the 12:00 position, with the pointer rotating very rapidly in the fast direction.
1026	In considering the status of the synchroscope pointer as shown in figure "B" of the illustration, at what point should the circuit breaker for the incoming machine be closed if paralleling manually?	Just before the 12:00 position, with the pointer rotating very rapidly in the fast direction.	Just before the 12:00 position, with the pointer rotating very slowly in the slow direction.	**Just before the 12:00 position, with the pointer rotating very slowly in the fast direction.**	Just before the 12:00 position, with the pointer rotating very rapidly in the slow direction.
1027	In considering the waveforms as shown in figure "A" of the illustration, what would be the position of the synchroscope pointer as shown in figure "B" of the illustration at the instant the waves are in synchronism?	**The pointer would be at the 12:00 position.**	The pointer would be at the 3:00 position.	The pointer would be at the 6:00 position.	The pointer would be at the 9:00 position.
1028	In considering the waveforms as shown in figure "A" of the illustration, what would be the status of the synchroscope pointer as shown in figure "B" of the illustration?	The pointer would be rotating very rapidly in the fast direction.	The pointer would be rotating very rapidly in the slow direction.	**The pointer would be rotating very slowly in the fast direction.**	The pointer would be rotating very slowly in the slow direction.
1029	In D.C. motor construction, where are the commutating windings wound?	opposite main poles	**interpoles**	adjacent main poles	the rotor core

ID #	Question	Choice A	Choice B	Choice C	Choice D
1030	In D.C. motor construction, with regard to the individual armature coils' ends, which statement is true?	**The coil ends are connected to the commutator bars.**	The coil ends are imbedded into core slots.	The coil ends are crimped together with brush pigtails.	The coil ends are spliced with the field windings
1031	In electrical circuit schematics, a normally closed pressure switch is represented by which of the symbols shown in the illustration?	**1**	2	3	6
1032	In electrical circuit schematics, a normally open pressure switch is represented by which of the symbols shown in the illustration?	1	**2**	4	7
1033	In electronic circuitry, what does the abbreviation 'PCB' commonly represent?	pulse coded binary	**printed circuit board**	poly-coated braid	personal computer bits
1034	In electronic circuits, DC voltages can be positive (+) or negative (-) when measured with respect to a certain physical reference point? What would be an example or examples of such a reference point? I. Analog or digital circuitry 'common' bus or PCB 'common' trace. II. Chassis, console frame, or hull 'ground'.	I only	II only	**Both I and II**	Neither I nor II
1035	In figure "1" of the diagram shown in the illustration, the three phase step down power transformer has a turns ratio of four to one. If a three-phase 440 volt supply is connected to terminals "A1-B1-C1", what voltage should develop across terminals "A2-B2-C2"?	64 volts	**110 volts**	190 volts	762 volts
1036	In figure "1" of the illustration, what are the trip characteristics associated with this type of circuit breaker?	**inverse-time delay characteristic for sustained overloads**	instantaneous trip characteristic for sustained overloads	inverse-time delay characteristic for short-circuit protection	instantaneous trip characteristic for short-circuit protection
1037	In figure "1" of the illustration, what type of circuit breaker trip element is featured?	magnetic trip	shunt trip	ambient compensated trip	**thermal trip**
1038	In figure "2" of the diagram shown in the illustration, the three phase power transformer has a step-down turns ratio of four to one. If a three-phase 440 volt supply is connected to terminals 'A1-B1-C'1, what voltage should develop across terminals 'A2-B2-C2'?	64 volts	**110 volts**	**190 volts**	762 volts
1039	In figure "2" of the illustration, what are the trip characteristics associated with this type of circuit breaker?	inverse-time delay characteristic for sustained overloads	instantaneous trip characteristic for sustained overloads	inverse-time delay characteristic for short-circuit protection	**instantaneous trip characteristic for short-circuit protection**
1040	In figure "2" of the illustration, what type of circuit breaker trip element is featured?	**magnetic trip**	shunt trip	ambient compensated trip	thermal trip

ID #	Question	Choice A	Choice B	Choice C	Choice D
1041	In figure "3" of the diagram shown in the illustration, the three phase step down power transformer has a turns ratio of four to one. If a three-phase 440 volt supply is connected to terminals 'A1-B1-C1', what voltage should develop across terminals 'A2-B2-C2'?	64 volts	110 volts	**190 volts**	762 volts
1042	In figure "3" of the illustration, what type of circuit breaker trip element is featured?	magnetic trip	**thermal and magnetic trip**	ambient compensated trip	thermal trip
1043	In figure "4" of the diagram shown in the illustration, the three phase step down power transformer has a turns ratio of four to one. If a three-phase 440 volt supply is connected to terminals 'A1-B1-C1', what voltage should develop across terminals 'A2-B2-C2'?	**64 volts**	110 volts	190 volts	762 volts
1044	In figure "A" of the illustrated circuit, the amplifier is connected in what basic configuration?	**common emitter**	common collector	Darlington paired, capacitor coupled	common base
1045	In figure "A" of the illustrated circuit, what is the main purpose of the bias resistor Rb?	to eliminate the need for a collector-emitter battery for establishing forward collector-emitter bias	to eliminate the need for a collector-emitter battery for establishing reverse collector-emitter bias	**to eliminate the need for an emitter-base battery for establishing forward emitter-base bias**	to eliminate the need for an emitter-base battery for establishing reverse emitter-base bias
1046	In figure "A" of the illustrated circuit, what is the resistance across R2 if the battery voltage is 32 VDC, the resistance of R1 is 1.2 k ohms and the current through R2 is 18.82 milliamps?	10 ohms	**500 ohms**	1200 ohms	The answer can not be found with the information given.
1047	In figure "A" of the illustrated circuit, what is the voltage of the battery if the resistance of R1 is 150 ohms, the total resistance is 250 ohms and the current though R2 is 25 milliamps when the switch is closed?	1.5 volts	**6.25 volts**	12 volts	24 volts
1048	In figure "A" of the illustrated circuit, with the switch closed what is the resistance of R2 if the total current is .75 amps, the source voltage is 12 VDC and the resistance of R1 is 24 ohms?	16 ohms	24 ohms	**48 ohms**	96 ohms
1049	In figure "A" of the illustration, 12 volts is applied to the circuit where the resistance of R1 is 10 ohms and R2 is 10 ohms. what is the voltage across R2 when the switch is closed?	1.2 volts	2 volts	**6 volts**	12 volts
1050	In figure "A" of the illustration, the battery Vbb and resistor Rb are in the circuit for what purpose?	**to apply a forward bias to the emitter-base**	to apply a reverse bias to the emitter-base	to apply a 'reference charge' on the input capacitor	to apply a buffer between the input ground and the emitter ground

ID #	Question	Choice A	Choice B	Choice C	Choice D
1051	In figure "A" of the illustration, the battery Vcc and the resistor RL are in the circuit for what functional purpose?	forward bias the emitter-base	reverse bias the emitter-base	forward bias the emitter/collector	**reverse bias the emitter/collector**
1052	In figure "A" of the illustration, what is the position of the circuit breaker?	on	**off**	tripped	not possible to determine
1053	In figure "B" of the illustrated circuit, if the resistance of R1 is 10 ohms, R2 is 10 ohms, and R3 is 10 ohms, what is the total resistance?	**15 ohms**	20 ohms	25 ohms	30 ohms
1054	In figure "B" of the illustrated control circuit schematic diagram, which of the listed devices prevents the forward and reversing coils from being energized simultaneously?	Forward and reverse pushbutton interlocking only	Forward and reverse pushbutton interlocking and normally open forward and reverse contactor auxiliary contacts	Normally closed forward and reverse contactor auxiliary contacts only	**Forward and reverse pushbutton interlocking and normally closed forward and reverse contactor auxiliary contacts**
1055	In figure of "A" of the illustrated circuit, what is the voltage measured across R1 if the battery voltage is 24 volts, the resistance of R1 is 34 ohms, and the resistance of R2 is 126 ohms when the switch is closed?	**5.1 volts**	18.9 volts	24 volts	150 millivolts
1056	In general, what can cause D.C. propulsion motor brush sparking to be excessive?	**incorrect brush grade, pressure or position**	a concentric commutator	a dark chocolate colored commutator	brushes positioned in the neutral plane
1057	In general, what type of starter would be used to connect polyphase induction motors to full line voltage at the instant of start-up?	compensator starters	auto-transformer starters	**across-the-line starters**	primary-resistor starters
1058	In general, why are nickel-cadmium storage batteries superior to lead-acid batteries?	they put out higher voltages and require no maintenance	**they can remain idle and keep a full charge for a long time**	they need fewer cells in series and use less mounting space	they are less costly to replace
1059	In interpreting 46 CFR, Subchapter J (Electrical Engineering), under what conditions must particular attention be paid when performing periodic inspections of electrical equipment?	**When circuits have been added or modified since the original issuance of the Certificate of Inspection**	When circuits have been removed since the original issuance of the Certificate of Inspection	When circuits have been added or modified prior to the original issuance of the Certificate of Inspection	When circuits have been removed prior to the original issuance of the Certificate of Inspection
1060	In interpreting 46 CFR, Subchapter J (Electrical Engineering), what are the acceptable variations of steady state voltage and frequency for electrical equipment rated for values of 460 VAC and 60 Hz?	**voltage between 414.0 and 487.6 VAC frequency between 57 and 63 Hz**	voltage between 432.4 and 506.0 VAC frequency between 57 and 63 Hz	voltage between 437.0 and 483.0 VAC frequency between 54 and 63.6 Hz	voltage between 437.0 and 483.0 VAC frequency between 56.4 and 66 Hz

ID #	Question	Choice A	Choice B	Choice C	Choice D
1061	In interpreting 46 CFR, Subchapter J (Electrical Engineering), what should the ambient temperature rating be on a replacement electric motor to be installed in the engine room of a vessel, assuming that it cannot be proven that the temperature will not exceed 45 degrees C in these spaces?	40 degrees C	45 degrees C	**50 degrees C**	55 degrees C
1062	In interpreting 46 CFR, Subchapter J (Electrical Engineering), what would be considered a 'corrosive location'?	a location exposed to the weather on a vessel operating only in fresh water	**a location exposed to the weather on a vessel that may operate in salt water**	a location within a machinery space subjected to the presence of steam	a location within a machinery space subjected to heavy condensation
1063	In order to change the direction of rotation of a D.C. Motor, what must be done? I. the field leads must be changed II. the input leads must be changed	**I only**	II only	either I or II	neither I or II
1064	In order to check the performance of a transistor removed from its circuit, what meter or tester should be used?	voltmeter or transistor tester	impedance meter	**ohmmeter or transistor tester**	sensitive potentiometer
1065	In order to definitively determine whether or not fuse "1", shown in the illustration is blown using an on-line testing technique, across what points would you connect the voltmeter leads?	the top of fuse "1" and the top of either fuse "2 or 3"	the top of fuse "1" and the bottom of either fuse "2 or 3"	**the bottom of fuse "1" and the top of either fuse "2 or 3"**	the bottom of fuse "1" and the bottom of either fuse "2 or 3"
1066	In order to definitively determine whether or not fuse "2", shown in the illustration is blown using an on-line testing technique, across what points would you connect the voltmeter leads?	the top of fuse "2" to the bottom of either fuse "1 or 3"	**the bottom of fuse "2" to the top of either fuse "1 or 3"**	the top of fuse "2" to the top of either fuse "1 or 3"	the bottom of fuse "2" to the bottom of either fuse "1 or 3"
1067	In order to definitively determine whether or not fuse "3", shown in the illustration is blown using an on-line testing technique, across what points would you connect the voltmeter leads?	the bottom of fuse "3" and to the bottom of either fuse "1 or 2"	**the bottom of fuse "3" and to the top of either fuse "1 or 2"**	the top of fuse "3" and to the top of either fuse "1 or 2"	the top of fuse "3" and to the bottom of either fuse "1 or 2"
1068	In order to properly set up programmable motor protection, it is necessary to know the locked rotor current of a motor. Given the illustrated chart of code letters for locked-rotor kVA/HP and the necessary instructions, calculate the estimated locked rotor current for the motor represented by the illustrated motor nameplate using a mid-range value for the code letter, assuming the motor is to run at 440 VAC.	34.7 amps	**43.7 amps**	60 amps	75.6 amps
1069	In order to safely carry out repairs to a generator circuit breaker, it must be isolated from the bus. How is this accomplished?	opening the reverse power relay	**opening the bus disconnect links**	opening the generator bus fuse connections	opening the reverse current relay

ID #	Question	Choice A	Choice B	Choice C	Choice D
1070	In order to take a current reading with a 'clamp-on' ammeter, what should be the status of the jaws of the instrument?	should remain open while conducting measurements	must be held so as to not touch an adjacent conductor	**must be fully closed so as to complete the magnetic circuit**	must be clamped around all of the conductors of a cable
1071	In performing routine maintenance of a ship's service alternator, what should be included?	changing the pedestal bearing insulation yearly	megger testing of all rectifying diodes	lubricating exciter slip rings	**periodic cleaning of the air filters or screens**
1072	In performing the insulation resistance tests as indicated by figures "1" and "2", what conclusion may be drawn?	Circuit #1 is grounded at phase "a" and circuit #6 is grounded at phase "c".	**Circuit #1 is grounded at phase "a" and circuit #6 is clear of grounds at phase "c".**	Circuit #1 is clear of grounds at phase "a" and circuit #6 is grounded at phase "c".	Circuit #1 is clear of grounds at phase "a" and circuit #6 is clear of grounds at phase "c".
1073	In performing the insulation resistance tests as indicated by figures "3" and "4", what conclusion may be drawn?	**Circuit #1 is grounded somewhere along the conducting path of conductors "u", "v", and "w".**	Circuit #1 is grounded somewhere along the conducting path of conductors "x", "y", and "z".	Circuit #1 is grounded along the conducting path of conductor "u", while the conducting path of conductors "v", and "w" are clear of grounds.	Circuit #1 is grounded along the conducting path of conductor "x", while the conducting path of conductors "y", and "z" are clear of grounds.
1074	In performing the insulation resistance tests as indicated by figures "5" and "6", what conclusion may be drawn?	Circuit #1 is grounded somewhere along the conducting path of conductors "v" and "w".	Circuit #1 is clear of grounds along the conducting path of conductors "v" and "w".	Circuit #1 is grounded along the conducting path of conductor "v", while the conducting path of conductor "w" is clear of grounds.	**Circuit #1 is clear of grounds along the conducting path of conductor "v", while the conducting path of conductor "w" is grounded.**
1075	In preparation for eventual paralleling of generators, if the condition of the electric plant is as shown in graph "A", what will be the status of the synchronizing lamps as shown in circuit "B" of the illustration?	The lamps will cycle on and off in a clockwise sequence in the slow direction.	The lamps will cycle on and off in a counter-clockwise sequence in the slow direction.	**The lamps will cycle on and off in a clockwise sequence in the fast direction.**	The lamps will cycle on and off in a counter-clockwise sequence in the fast direction.
1076	In preparation for eventual paralleling of generators, if the condition of the electric plant is as shown in graph "A", what will be the status of the synchronizing lamps as shown in circuit "C" of the illustration?	The two lamps will cycle on and off alternately.	**The two lamps will cycle on and off in together in unison.**	The two lamps will cycle on and off in a clockwise sequence.	The two lamps will cycle on and off in a counter-clockwise sequence.
1077	In preparation for paralleling generators, if the electric plant condition is as shown by graph "A", what would be the rotational status of the synchronizing lamps as shown in circuit "B"?	Revolve slowly in the slow direction.	Revolve rapidly in the slow direction.	**Revolve slowly in the fast direction.**	Remain stationary.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1078	In preparing to take insulation resistance readings on a main generator, the windings should be grounded for about 15 minutes prior to the test. For what reason should this be done?	allow accurate zeroing of the meter	help the windings to cool to ambient temperature	**release any residual capacitive charge from the windings**	help the windings to cool to the same temperature as the ground test connection
1079	In process control terminology, continuously variable values which change without distinct increments, such as temperature, pressure, or level are correctly referred to as what type of values?	binary values	digital values	bumpless values	**analog values**
1080	In terms of criteria, how is the need for insulation cleaning determined?	**visual inspection for dirt accumulation**	high megger readings	low operating temperature	the time period since the last cleaning
1081	In terms of electrolyte (acidity or alkalinity) and battery recharge ability (primary or secondary), what do common wet-cell nickel-cadmium storage batteries utilize?	acid primary cells	alkaline primary cells	acid secondary cells	**alkaline secondary cells**
1082	In terms of load type, in what type of alternating current circuit will the current always lag the voltage?	capacitive circuit	**inductive circuit**	resistive-capacitive circuit	resistive circuit
1083	In terms of load type, in what type of alternating current circuit will the voltage always lead the current?	capacitive circuit	**inductive circuit**	resistive-capacitive circuit	resistive circuit
1084	In terms of the battery electrolyte, when performing maintenance of alkaline batteries what should be done?	checking the electrolyte weekly using a hydrometer	replacing the electrolyte every 5 years	**wearing protective gloves and goggles when handling electrolyte**	replacement of the electrolyte when the volts per cell drops below 1.8 VDC
1085	In terms of units, how is the inductance of a coil measured?	ohms	volts	**henries**	amperes
1086	In terms of voltage potential and current sources, how are shunt wound, series wound, and compound wound DC motors designed to operate?	**constant potential, variable current DC sources**	variable potential, constant current DC sources	variable potential, variable current DC sources	constant potential, constant current DC sources
1087	In testing a hand cranked megger prior to use, what statement is true?	With the test leads shorted, the pointer should go to infinite ohms, and with the tests leads open, the pointer should go to zero ohms.	**With the test leads shorted, the pointer should go to zero ohms, and with the tests leads open, the pointer should go to infinite ohms.**	With the test leads shorted or open, the pointer should go to infinite ohms.	With the test leads shorted or open, the pointer should go to zero ohms.
1088	In testing a three-phase delta-connected winding for an open circuit using a ohmmeter, what must be done?	test each phase with all connections intact	measure the voltage across the open connections while testing	test the windings as parallel groups to avoid short circuiting	**if possible, open the delta-connections to avoid shunting the phase being tested**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1089	In the alternator excitation scheme shown in the illustration, what is the purpose of the "3-Ph Diode Bridge", also known as a rotating rectifier?	**To convert the AC output of the exciter armature to DC for main rotor field excitation**	To convert the DC output of the main rotor field to AC for exciter armature excitation	To convert the DC output of the exciter armature to AC for main rotor field excitation	To convert the AC output of the main rotor field to DC for exciter armature excitation
1090	In the alternator excitation scheme shown in the illustration, where are brushes required?	Rotating exciter armature only	Rotating main rotor field only	Both rotating exciter armature and rotating main rotor field	**No brushes are required**
1091	In the alternator excitation scheme shown in the illustration, which of the following components is stationary and housed within the generator frame?	The automatic voltage regulator	The exciter armature	The 3-Ph diode bridge	**The main stator**
1092	In the circuit 'B' of the illustration, what would be the result of the upper heating element being burned out and open circuited?	low heat (series) position would result in no heat at all medium heat (single) position would result in medium heat high heat (parallel) position would result in medium heat	low heat (series) position would result in low heat medium heat (single) position would result in medium heat high heat (parallel) position would result in medium heat	**low heat (series) position would result in no heat at all medium heat (single) position would result in no heat at all high heat (parallel) position would result in medium heat**	low heat (series) position would result in low heat medium heat (single) position would result in medium heat high heat (parallel) position would result in medium heat
1093	In the circuit illustrated in figure "A", the amplifier is connected in what basic configuration?	common base	reverse bias, negative feedback	**common emitter**	common collector
1094	In the circuit illustrated in figure "B", the amplifier is connected in what basic configuration?	**common base**	reverse bias, negative feedback	common emitter	common collector
1095	In the circuit illustrated in figure "C", the amplifier is connected in what basic configuration?	common base	reverse bias, negative feedback	common emitter	**common collector**
1096	In the construction of compound wound D.C. motors, how are the series and shunt fields physically arranged?	on opposite main stator poles	together on the armature	together on the interpoles	**together on the main stator poles**
1097	In the event of a power failure during cargo loading operations, the movement of an electric powered cargo winch will be stopped by what means?	a manual override switch	the weight of the load on the boom	**a spring set brake**	a hand operated band brake
1098	In the flow of one cycle of single phase alternating current past any given point in a circuit, how many times will the current peak to a maximum?	one time	**two times**	three times	four times

ID #	Question	Choice A	Choice B	Choice C	Choice D
1099	In the illustrated amplifiers in all three figures, in terms of doping, the base of the silicon semiconductor transistor is what type of material?	N type material with increased free electrons	**P type material with decreased free electrons**	N type material with decreased free electrons	P type material with increased free electrons
1100	In the illustrated circuit in figure "A", the voltage is provided by a 12 Volt lead acid battery and the resistor value is 3 ohms. When the switch is closed, if the battery is rated for 120 amp-hours, how long will it take before the voltage will drop to 1.75 volts per cell?	12 hours	1.75 days	**30 hours**	2.5 days
1101	In the illustrated circuit in figure "A", what is the total current with the switch closed if the source voltage is 12 VDC, the resistance of R1 is 15 ohms, and the resistance of R2 is 10 ohms, respectively?	.55 amps	0.8 amps	1.5 amps	**2 amps**
1102	In the illustrated circuit of figure "A", if the battery voltage is 24 VDC, the resistance of R1 is 24 ohms, and the resistance of R2 is 24 ohms, what will be the resulting total current with the switch closed?	0.5 amp	1 amp	**2.0 amp**	2.4 amps
1103	In the illustrated circuit of figure "A", what is the total resistance if the source voltage is 10 VDC, the resistance of R2 is 40 ohms and the total current is .75 amps with the switch closed?	**13.33 ohms**	20 ohms	60 ohms	66.67 ohms
1104	In the illustrated circuit, what is one advantage of the RC coupling over a direct coupling?	as the frequency decreased the capacitive reactance (Xc) increases	the amplifier becomes more efficient at lower capacitance.	**the arrangement allows the coupling of the signal while it isolates the biasing of each stage.**	good frequency response.
1105	In the illustrated cutaway view of a lead acid battery shown in figure "A" of the illustration, what is the purpose of the series connecting straps?	to allow multiple cells to be connected in such a way as to increase the ampere-hour capacity of the battery	**to allow multiple cells to be connected in such a way as to increase the voltage output of the battery**	to connect the positive plate group terminal of one cell to the positive plate group terminal of the adjacent cell	to connect the negative plate group terminal of one cell to the negative plate group terminal of the adjacent cell
1106	In the illustrated motor controller, the motor fails to start. A voltmeter reading between 1 and 5 reads line voltage, while the voltmeter reading between 2 and 5 reads 0 VAC. What is most likely the problem?	an open main contactor "M" coil	**an open stop switch contact (when not pushed in)**	an open start switch contact (when pushed in)	an overload "OL" relay contact
1107	In the illustrated motor controller, what do the contacts across terminals "3" and "4" of the control circuit represent?	**normally-closed overload relay contact**	thermal overload heater	normally-open overload relay contact	magnetic overload coil

ID #	Question	Choice A	Choice B	Choice C	Choice D
1108	In the illustrated Ni-Cad alkaline battery, how many cells are shown?	**1**	2	3	4
1109	In the illustrated one line diagram, if the ship's service generator on line fails, what statement is true concerning the operation of the emergency diesel generator?	It will automatically start and automatically supply power to the 450 VAC section of the main bus through the automatic bus transfer device.	**It will automatically start and automatically supply power to the 450 VAC section of the emergency bus through the automatic bus transfer device.**	It will automatically start but the automatic bus transfer device must be manually shifted to 'Emergency Power' to supply the 450 VAC section of the emergency bus.	It must be manually started but once running will automatically supply power to the 450 VAC section of the emergency bus through the automatic bus transfer device.
1110	In the illustrated silicon controlled rectifier as shown in illustration "B", which labeled lead of the SCR represents the anode?	**1**	2	3	there is no standardization of leads in this configuration
1111	In the illustrated silicon controlled rectifier as shown in illustration "B", which labeled lead of the SCR represents the cathode?	1	**2**	3	there is no standardization of leads in this configuration
1112	In the illustrated silicon controlled rectifier as shown in illustration "B", which labeled lead of the SCR represents the gate?	1	2	**3**	there is no standardization of leads in this configuration
1113	In the illustrated solid-state "soft" starter for a three phase induction motor as shown in figure "A", what is the characteristic of the voltage applied to the motor during the acceleration period?	voltage is applied only during positive half-cycles during the acceleration period	voltage is applied only during negative half-cycles during the acceleration period	voltage is increased in incremental steps during the acceleration period	**voltage is gradually and continually ramped up during the acceleration period**
1114	In the illustrated solid-state "soft" starter for a three phase induction motor as shown in figure "A", what is the name of the devices that are controlled by the gate control circuits?	semiconductor diodes	varactors	**thyristors**	zener diodes
1115	In the illustrated switchboard, if both generators were operating in parallel and the kilowatt meter of panel 3 indicated a significantly higher value than the kilowatt meter on panel 1, which of the following procedures should you follow to balance the load?	**Increase the governor speed setting in panel 1 and decrease the governor speed setting on panel 3**	Increase the governor speed setting in panel 3 and decrease the governor speed setting on panel 1	Increase the setting of the voltage regulator in panel 3 and decrease the voltage regulator setting on panel 1	Increase the setting of the voltage regulator in panel 3 and decrease the governor setting on panel 1

ID #	Question	Choice A	Choice B	Choice C	Choice D
1116	In the illustrated switchboard, if one of the devices labeled 'Turbine' should fail due to a throttle trip, what will happen?	device labeled 'Exciter' will drive the alternator	**device labeled 'Circuit Breaker' for that alternator should automatically open because of the reverse power relay**	operator must open all the devices labeled 'Circuit Breakers' to reduce the load on the remaining turbo-alternator	emergency generator should automatically start and be placed on line to supply emergency load centers
1117	In the illustrated switchboard, what is the function of the device labeled "Gen.Bkr.Sw."?	it allows the alternator circuit breaker trip function to be over-ridden	it allows the alternator circuit breaker overload inverse time trip rating to be remotely adjusted at the synchronizing panel	**it allows the alternator circuit breaker to be opened or closed remotely at the synchronizing panel**	it allows the alternator circuit breaker short circuit trip rating to be remotely adjusted at the synchronizing panel
1118	In the illustrated switchboard, what is the purpose of the device labeled "AM Sel.Sw."?	it allows the instantaneous average of the three phase legs of alternator current to be displayed on the ammeter	**it allows the individual three phase legs of alternator current to be displayed on the ammeter by selective switching**	it allows the instantaneous difference between individual three phase legs to be displayed on the ammeter	it allows the instantaneous difference between the average of the three phase legs of both alternators to be compared
1119	In the illustrated three phase galley oven circuit shown in figure "A", what would be the result of a 1 amp control fuse blowing?	only oven heating elements #1 and #2 would energize	only oven heating elements #6 and #7 would energize	only oven heating elements #3, #4, and #5 would energize	**no oven heating elements would energize**
1120	In the illustrated three phase galley oven circuit shown in figure "A", what would be the result of the 10 amp power fuse in line L1 blowing?	only oven heating elements #1 and #2 would energize	**only oven heating elements #6 and #7 would energize**	only oven heating elements #3, #4, and #5 would energize	no oven heating elements would energize
1121	In the illustrated three phase galley oven circuit shown in figure "A", what would be the result of the 10 amp power fuse in line L1 blowing?	only oven heating elements #1 and #2 would energize	**only oven heating elements #6 and #7 would energize**	only oven heating elements #3, #4, and #5 would energize	no oven heating elements would energize
1122	In the illustrated three phase galley oven circuit shown in figure "A", what would be the result of the 10 amp power fuse in line L2 blowing?	only oven heating elements #1 and #2 would energize	only oven heating elements #6 and #7 would energize	**only oven heating elements #3, #4, and #5 would energize**	no oven heating elements would energize
1123	In the illustrated three phase galley oven circuit shown in figure "A", what would be the result of the 10 amp power fuse in line L3 blowing?	**only oven heating elements #1 and #2 would energize**	only oven heating elements #6 and #7 would energize	only oven heating elements #3, #4, and #5 would energize	no oven heating elements would energize

ID #	Question	Choice A	Choice B	Choice C	Choice D
1124	In the illustrated views of a lead acid battery as shown in figures "A" and "B", what battery component has the sole function of preventing the individual plates in the negative plate group from coming into direct contact with the individual plates in the positive plate group?	cell dividers	series connecting straps	casing	**separators**
1125	In the illustration shown, what type of protection is provided the potable pump drive motor?	magnetic overload protection and low voltage protection	thermal overload protection and low voltage protection	magnetic overload protection and low voltage release	**thermal overload protection and low voltage release**
1126	In the illustration shown, what would be the functional name for the coil represented as '1S'?	1st speed contactor coil	start contactor coil (for autotransformer connection to line)	**neutral contactor coil (for autotransformer wye connection)**	0% contactor coil
1127	In the illustration shown, what would be the functional name for the coil represented as 'R'?	**run contactor coil**	rupture (blowout) coil	resistance coil	reversing coil
1128	In the illustration, 1, 2, 3 and 4 are 12 volt batteries. What will be the nominal voltage as read by a voltmeter across the output of the battery bank?	6 volts	12 volts	**24 volts**	48 volts
1129	In the lighting distribution circuit shown in the illustrated lighting panel L110 of the illustration, if all circuit breakers are closed and due to a problem with the relevant feeder circuit breaker, there is a loss of power on the incoming phase A, which of the following statements is true?	All of the receptacles in the laundry would lose power.	All of the accommodation lighting circuits on the 01 deck, starboard side would lose power.	Half of the passageway lighting circuits on the 01 deck would lose power.	**Half of the accommodation lighting circuits on the 01 deck, port side would lose power.**
1130	In the regulated DC power supply illustrated, what is the function of section "B"	**full wave rectification**	half wave rectification	quarter wave rectification	short wave rectification
1131	In the schematic of the electrical circuit shown in figure "A" of the illustration, what is the value of the total capacitance, when compared to the value of equal individual capacitors?	one fourth	**one half**	double	quadruple
1132	In the schematic of the electrical circuit shown in figure "A" of the illustration, what is the value of the total capacitance, when compared to the value of equal individual capacitors?	Equal	Half	**Double**	Squared
1133	In the system shown in the illustration, the engine room station is unable to signal any other station, nor is any other station able to signal the engine room station. The engine room station can, however, ring itself by proper positioning of its selector switch. What is the most probable cause of this problem?	The selector switch is grounded at the problem station diverting current from the other stations' ringing devices.	**There is an open between terminal "C" of the problem station and the common wire of the multi-conductor cable to the other stations.**	The coil of component "C" of the problem station is open circuited.	The switch at component "A" of the problem station is stuck open.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1134	In troubleshooting a circuit in a console, you find that a resistor may be faulty. Which of the precautions listed must be observed when using an analog or digital multimeter set up as an ohmmeter to carry out this test?	Correct polarity must be observed, connecting the red lead to the banded end of the resistor.	Meter leads must be twisted to cancel the leads' magnetic fields.	The meter must be placed in series with the resistor and the circuit.	**The resistor's circuit must be de-energized and at least one end of the resistor isolated by disconnecting.**
1135	In using a portable growler for the purpose of locating a shorted stator coil in an AC motor as shown in the illustration, what statement is true as the feeler is moved from slot to slot around the stator?	**The feeler will vibrate in synchronism with the 60 Hz AC power source and produce a growling noise when the feeler is moved over a slot containing a shorted coil.**	The feeler will vibrate in synchronism with the 60 Hz AC power source and produce a growling noise when the feeler is moved over a slot which does NOT contain a shorted coil.	The feeler will remain motionless with NO vibration or noise when the feeler is moved over a slot containing a shorted coil.	The feeler will vibrate in synchronism with the 60 Hz AC power source and produce a growling noise when the feeler is moved over a slot containing an open coil.
1136	In what applications are germanium semiconductor diodes commonly used?	potentiometers	**rectifiers**	power sources	photocells
1137	In what situation would an electrical phase sequence indicator be useful?	preparing to parallel alternators	connecting lighting branch circuits	troubleshooting DC motors	**connecting shore power lines to the ship**
1138	In which figure shown in the illustration will the highest voltage be induced?	figure "A" only	figure "B" only	both figures "A" and "C"	**both figures "B" and "D"**
1139	In which of the situations listed will a megohmmeter give the most accurate readings?	While the machine is in operation.	While the machine is discharging static electricity.	Immediately prior to restarting the machine.	**When the machine has been shut down and grounded for a period of 15 minutes.**
1140	In which section of the 24 VDC power supply circuit illustrated does the greatest change in voltage level take place when fed from 120 VAC ship's power?	**A**	B	C	D
1141	Incandescent lamps are classified according to the shape of the bulb and the type of service, as well as the size and style of the base. How are incandescent lamps rated?	operating resistance	operating frequency and impedance	**operating voltage and wattage**	operating reactance
1142	It is desired to add additional 120 VAC, 100 watt lighting fixtures in the accommodations, port side fed from circuit #1 (1L110) as illustrated in the lighting panel L110 of the illustration. According to 46 CFR 111.75-5, would be the maximum allowable additional lighting fixtures that could be installed?	1 fixture	**2 fixtures**	3 fixtures	4 fixtures

ID #	Question	Choice A	Choice B	Choice C	Choice D
1143	It is desired to add additional 120 VAC, 100 watt lighting fixtures in the accommodations, port side fed from circuit #3 (3L110) as illustrated in the lighting panel L110 of the illustration. According to 46 CFR 111.75-5, would be the maximum allowable additional lighting fixtures that could be installed?	1 fixture	2 fixtures	**3 fixtures**	4 fixtures
1144	It is desired to replace the deck matting in front of a switchboard. According to the 46 CFR, Subchapter J (Electrical Engineering), what would be a suitable replacement?	any non-conductive mat similar in appearance to the one being replaced	**a non-conductive mat or grating rated for the specific switchboard voltage**	a non-conductive grating must be used as non-conductive mats are no longer approved	the mat need not be replaced if the decking in front of the switchboard is adequately painted
1145	Large machines undergoing a resistance insulation testing using a megohmmeter should be discharged to remove any accumulated electrostatic/capacitive charge stored. When should this discharge be performed?	prior to conducting the insulation resistance check only	while performing the insulation resistance check only	after conducting the insulation resistance check only	**prior to and after conducting the insulation resistance check**
1146	Low horsepower, polyphase, induction motors can be started with full voltage by means of which kind of starter?	compensator starters	auto-transformer starters	**across-the-line starters**	primary-resistor starters
1147	Low voltage release and low voltage protection both function to prevent motor damage due to low voltage conditions. What is the main difference between a motor control circuit containing low voltage protection as compared to low voltage release?	low voltage protection uses a magnetic operating coil, low voltage release does not	low voltage protection uses normally open line contacts, low voltage release uses normally closed line contacts	low voltage protection uses thermal-overload protection, low voltage release does not	**low voltage protection uses a momentary-contact start switch, low voltage release uses a maintained contact start switch**
1148	Magnetic controller contacts may become welded together during operating conditions as a result of what condition?	high spring pressure	high ambient temperature	an open coil	**low voltage on operating coil**
1149	Materials that retain a large part of their magnetization, after the magnetizing force is removed are considered to be permanent magnets. What characteristic of the material is responsible for this permanence?	low magnetic hysteresis	low ductility	**high magnetic hysteresis**	high ductility
1150	Mercury filled thermometers should NEVER be used to determine the temperature of the battery electrolyte due to the impact of accidental breakage. What could happen as a result of failure to observe this safety precaution?	**severe sparking and explosions**	rapid oxidation of battery plates	contamination of the electrolyte	corrosion on the battery terminals

ID #	Question	Choice A	Choice B	Choice C	Choice D
1151	Moisture accumulating in electric motors and generator windings having a cold insulation resistance greater than 50,000 ohms may be baked out with internal heat. What is the usual method for developing this heat to evaporate the moisture?	**feeding current into the windings at low voltage**	short circuiting the armature and field windings	short circuiting the field windings and passing current through the armature	obtaining current from a DC source such as an electric welder and feeding it into the armature while running the motor at full speed
1152	Moisture damage, as a result of condensation occurring inside of the cargo winch master switches, can be reduced by the use of what installed equipment?	installing a light bulb in the pedestal stand	coating the switch box internals with epoxy sealer	venting the switch box regularly	**using strip heaters inside the switch box**
1153	Most conducting materials such as copper, aluminum, iron, nickel, and tungsten behave in such as way as the resistance and conductance is predictably effected by temperature. Which statement is true regarding this behavior?	**conductor resistance increases with increased temperature**	conductor resistance increases with decreased temperature	conductor resistance decreases with increased temperature	conductor conductance increases with increased temperature
1154	Most three-phase induction motors used for driving engine room auxiliaries are started by what means?	resistor starters	**across-the-line starters**	impedance starters	reactor starters
1155	Motor controller or starter contacts may become pitted and welded together under certain circumstances. What would be the primary cause?	open under loaded conditions	**close slowly with light pressure**	open too quickly and arc	close quickly with proportionate pressure
1156	Motor name plate data includes " degrees Centigrade temperature rise ". What does this indicate?	actual running temperature of the winding from no load to full load	**permissible temperature rise of the windings above the designed ambient temperature**	maximum allowable temperature rise above normal full load operating temperature	maximum allowable temperature rise for continuous no load service
1157	Motor starter or controller contacts may become welded together under what condition?	open too quickly and arc	close under excessive pressure	open or close too quickly	**close under excessive starting current**
1158	Multiple grounds have developed and were initially indicated by the ground-detecting system as one ground. What is the FIRST step in locating the grounds?	examine the main bus bars for signs of overheating	**eliminate the individual circuits one by one until the ground detecting system no longer indicates any grounds**	change over generators	check each circuit with a megohmmeter
1159	Normally, what is the FIRST step in troubleshooting a transistor mounted on a circuit card?	carefully remove the transistors from the card	give the circuit an initial test with a signal generator	test for continuity with a low voltage DC supply	**visually inspect the card**
1160	Of the following listed single-phase induction motors, which has the highest starting torque?	shaded pole motor	resistive start induction run motor	**capacitor start induction run motor**	permanent split capacitor motor

ID #	Question	Choice A	Choice B	Choice C	Choice D
1161	Of the listed factors that influence the amount of RMS voltage induced in the windings of an AC generator operating at a constant 60 Hz frequency, which factor is variable during generator operation?	the number of armature coil turns in series per winding	the rotational speed at which the magnetic field passes across the stator winding	**the strength of the rotating magnetic field**	the number of field coil turns in series per winding
1162	Of the various possible methods shown in the illustration, which is the correct method of attaching a TXV feeler bulb to a small large line (7/8" and larger) with a horizontal run?	A	B	**C**	D
1163	Of the various possible methods shown in the illustration, which is the correct method of attaching a TXV feeler bulb to a small suction line (less than 3/4") with a horizontal run?	A	B	**C**	D
1164	On a digital numerical display readout, what would be the minimum number of LED segments required to form and display any digit 0 through 9?	6	**7**	8	9
1165	On a main switchboard, if all three ground detection lamps burn with equal intensity before and after the test button is depressed, which of the listed conditions is indicated?	**The bulbs are operating properly and no grounds exist**	All three phases are grounded.	The test switch is grounded.	The current transformers are shorted.
1166	On a vessel with turbo-electric drive, which of the following conditions would indicate that the propulsion motor had dropped out of synchronization with the propulsion generator?	**Excessive vibration of the vessel**	Tripped main motor interlocks	Overheated crosstie busses	Closed contact in the field circuits
1167	On an engine throttle control system, the auxiliary control circuits are provided with devices to prevent excessive overtravel of the actuating valve by the control motor. What are these devices commonly called?	overlap sensors	**limit switches**	differential relays	analog relays
1168	On DC diesel-electric drives, how is the speed of the DC propulsion motor primarily controlled?	**changing the generator engine speed**	changing the generator field excitation current	changing the polarity of the generator field	changing the motor field excitation current
1169	On electric propulsion drive ships, Silicon-Controlled Rectifiers can be used to control which of the following? I. DC propulsion motors II. AC propulsion motors	I only	II only	**Both I and II**	Neither I or II

ID #	Question	Choice A	Choice B	Choice C	Choice D
1170	On some electrical generating equipment one outboard bearing pedestal is insulated from the bedplate. This should be checked with a millivolt meter and a jumper. With the millivolt meter connected between the shaft and the bedplate how should the jumper be used?	It should be placed from one end of the shaft to the other to eliminate shaft currents.	It is used to short the + and - in a D.C. generator or Phase A and Phase C in an alternator to eliminate the effects of CEMF.	It should be placed across the insulating block to increase the shaft current to a point where it can be measured with the millivolt meter.	**It should be placed from the shaft to the pedestal while one reading is taken, then removed to take a second reading. This eliminates the insulating effect of the bearing.**
1171	On tank vessels with an electrically-driven capstan, the motor should be meggered periodically. What is being tested for when meggering?	**insulation resistance**	eddy currents	capacitance	armature reactance
1172	On the electrical one line diagram shown in the illustration, what statement is true concerning the illustrated battery charger switching arrangements?	In an emergency, the battery charger source voltage is from the 24 V interior communications bus.	It is possible to configure the charger to charge the same battery that is connected to the 24 V interior communications bus.	**Depending upon the switch position, at any given time, one battery is on charge from the battery charger and the other battery is on service delivering DC power to the 24 V interior communications bus.**	The battery charger receives AC power from the 120 VAC section of the emergency section only when the electric plant is in the emergency mode of operation.
1173	On vessels with AC distribution systems, which of the following statements represents the most difficult problem involved in obtaining a DC potential suitable for use by computer components?	A stepdown transformer is always required.	Vessel vibrations affect the voltage source.	**The voltage must be rectified and made ripple free.**	Rectifiers cannot operate with voltage regulators.
1174	One diode of a single phase, center tap, full-wave rectifier has burned out in a shorted condition. Therefore, what would the output condition be?	zero	a rectified half-wave DC	a rectified full-wave DC	**equal to the rectifier AC input**
1175	One item listed on the name plate of a cargo pump motor is 'degrees centigrade rise.' What does the number stamped for this item represent?	the normal temperature rise from cold to hot	**the maximum temperature rise above an ambient temperature of 40°C**	the minimum temperature rise from no load to full load	the maximum temperature rise from absolute zero
1176	One method of testing for a reversed shunt field coil in a DC motor is by connecting the coil to a low voltage source, and testing for polarity. How is this done?	placing an iron bar across each field	**placing a magnetic compass near each field**	connecting a test lamp across adjacent fields	connecting a copper jumper across the interpole connections

ID #	Question	Choice A	Choice B	Choice C	Choice D
1177	Periodic testing using a special camera may be performed to detect potentially dangerous loose or corroded bus bar and controller connections. What is the name of this testing technology?	**heat sensitive thermography**	visual pyrotronics	corrosion electrolysis	electric vibroanalysis
1178	Power conversion for use in DC propulsion drive motors is accomplished by what type of converter?	cycloconverters	pulse width modulated converters	load commutated converters	**silicon controlled rectifier converters**
1179	Prior to closing the breaker when paralleling two AC generators, in terms of the oncoming machine frequency, what is the recommended practice?	slightly less than the line frequency	the same as the line frequency	**slightly greater than the line frequency**	exactly 60 Hz regardless of the line frequency
1180	Prior to closing the circuit breaker when paralleling two DC generators, what must you be certain of?	**voltage of the incoming machine is at or slightly above the bus voltage**	frequency of the incoming machine is slightly higher than the bus frequency	synchroscope needle is revolving slowly in the 'fast' direction	current from the incoming machine is the same as the bus current
1181	Prior to manually starting an AC generator prime mover and paralleling in the manual control mode, what should be the position of the voltage regulator selector switch?	**manual position**	bus neutral position	automatic position	transfer position
1182	Prior to performing any internal maintenance on a large DC main propulsion motor, what precaution or precautions should be taken? I. De-energize, lock-out, and tag-out the motor electrically II. Engage the shaft brake	I only	II only	**Both I and II**	Neither I nor II
1183	Prior to taking a resistance reading with an analog volt-ohm-milliammeter, the 'zero' setting must be adjusted. After clipping the two leads together, you find the adjustment knob will not return the pointer to 'zero'. What is this most likely an indication of?	an improper resistance range setting	**weak batteries**	a faulty zero ohms knob	a faulty meter movement
1184	Prior to using an analog multimeter set up as an ohmmeter, the leads are purposely shorted together. Which of the following actions should be taken if, when adjusting to 'zero' ohms, the indicating needle can not be returned to 'zero' on the scale?	The lead clips should be replaced.	**The batteries should be replaced.**	The test reading should be added to each final reading.	The test reading should be subtracted from each final reading.
1185	Propulsion AC generators creating 4160 VAC use transformers to provide nominally 120 VAC to the automatic voltage regulator. What is the turns ratio of this step-down transformer?	4:1	1:4	**35:1**	40:1

ID #	Question	Choice A	Choice B	Choice C	Choice D
1186	Propulsion motor RPM can be indirectly indicated on a console by measuring the voltage delivered from what device?	**small permanent magnet generator**	vibrating reed frequency counter	ultraviolet radiation counter	shaft torque indicator transducer
1187	RC time constant characteristics, as shown in the illustration, are important in which of the following applications?	bridge rectifiers for alternator excitation	**timing and pulse shaping circuits**	transistor power amplifier biasing	motor controller overload protection
1188	Referring to figure "B" of the illustrated control circuit schematic diagram, which of the following statements is true when the motor is running in the forward direction?	The normally closed (NC) "F" contacts are closed.	**The normally open (NO) "F" contacts are closed.**	The normally closed (NC) "R" contacts are open..	The normally open (NO) "R" contacts are closed.
1189	Referring to figures "A" and "D" of the illustration what is the phase relationship of current to voltage in a purely capacitive circuit?	Current is in phase with the applied voltage.	**Current leads the applied voltage by 90 degrees.**	Current lags the applied voltage by 90 degrees.	Current leads the applied voltage by 180 degrees.
1190	Referring to figures "B" and "D" of the illustration what is the phase relationship of current to voltage in a purely inductive circuit?	Current is in phase with the applied voltage.	Current leads the applied voltage by 90 degrees.	**Current lags the applied voltage by 90 degrees.**	Current lags the applied voltage by 180 degrees.
1191	Referring to figures "C" and "D" of the illustration what is the phase relationship of current to voltage in a purely resistive circuit?	**Current is in phase with the applied voltage.**	Current leads the applied voltage by 90 degrees.	Current lags the applied voltage by 90 degrees.	Current lags the applied voltage by 180 degrees.
1192	Regarding an AC generator connected to the main electrical bus; as the electric load and power factor vary, a corresponding change is reflected in the generator armature reaction. How are these changes in armature reaction compensated for?	governor speed droop setting	**voltage regulator**	balance coil	phase-balance relay
1193	Regarding an AC induction motor, what is the output power developed by the motor related to?	speed of the rotating field	**slip of the rotor and resulting current**	current flow in the interpoles	DC field excitation
1194	Regarding an induction motor, what does the power developed by the rotor automatically adjusts itself to?	**power required to drive the load**	speed required to drive the load	current flow in the motor stator	torque developed by the rotating field
1195	Relative to the direction of rotation, which statement is true concerning a D.C. motor commutating pole polarity?	The commutating pole has the same polarity of the main pole following.	The commutating pole has the same polarity of the interpole following.	**The commutating pole has the same polarity of the main pole preceding.**	The commutating pole has the same polarity of the interpole preceding.
1196	Relative to the number of turns of a secondary winding of a step-up transformer, what will be the number of turns of a primary winding?	the primary winding will have more turns than the secondary winding	**the primary winding will have fewer turns than the secondary winding**	the primary winding will have the same number of turns but smaller wires than the secondary winding	the primary winding will have twice as many turns as the secondary winding

ID #	Question	Choice A	Choice B	Choice C	Choice D
1197	Relay-controlled emergency lanterns have an internal storage battery that is maintained in a charged state when normal power is available. According to 46 CFR, Subchapter J (Electrical Engineering), upon a loss of normal power, what is the minimum time the internal battery should be capable of providing light?	1 hour	**3 hours**	6 hours	12 hours
1198	Rotor-to-stator air gap readings for electrical generating equipment should be taken periodically. For what reason should these readings be taken? I. determine the condition of the bearings II. prevent damage to the rotor and stator	I only	II only	**both I and II**	neither I or II
1199	Rotor-to-stator air gap readings should be periodically taken for electrical generation equipment. What is the best tool to use to take these measurements?	cloth (non-metallic) tape measure	dial indicator	inside micrometer	**tapered, long blade, feeler gage**
1200	Rotor-to-stator air gap readings should be taken on electrical generation equipment periodically. Why is this necessary? I. check machine efficiency II. determine the need for cleaning	I only	II only	both I and II	**neither I or II**
1201	Rotor-to-stator air gap readings should be taken on electrical generation machinery periodically. Why is this so? I. determine the need for cleaning II. check the condition of the bearings	I only	**II only**	both I and II	neither I or II
1202	Ships requiring rapid maneuvering response with a high degree of main propeller shaft control are most often what type of drive system?	Steam turbine geared drive	Direct or geared diesel drive	**Diesel-electric drive**	Gas turbine geared drive
1203	Silicon diodes which are designed for a specific reverse breakdown voltage, and are most often used as electronic power supply voltage regulators, are specifically what type of diode?	tunnel diodes	hot-carrier diodes	compensating diodes	**Zener diodes**
1204	Some electrical schematics use "binary values" (Base 2), to represent and identify automation alarm addresses. Which of the following represents the "binary value" for the decimal number 7 (Base 10)?	0110	1110	**0111**	1001

ID #	Question	Choice A	Choice B	Choice C	Choice D
1205	Some large A.C. motors are equipped with heaters. These could be _____. I. resistance heaters bolted directly to the frame II. low voltage windings embedded in the motor windings	I only	II only	**either I or II**	neither I nor II
1206	Suppose a cargo vessel of 1600 gross tons or more is fitted with emergency storage batteries for the purpose of supplying emergency lighting and power. According to 46 CFR, Subchapter J (Electrical Engineering), the capacity of the storage batteries is such that they should be able to successfully power the emergency loads for a period of 18 hours. Beginning with fully charged batteries, what is the minimum allowable percentage of the voltage rating of the batteries after the 18 hour discharge period assuming a nominal voltage rating of 24 VDC and operating at rated capacity.	75%	80%	**88%**	95%
1207	Suppose a cargo vessel of 1600 gross tons or more is fitted with emergency storage batteries for the purpose of supplying emergency lighting and power. According to 46 CFR, Subchapter J (Electrical Engineering), the capacity of the storage batteries is such that they should be able to successfully power the emergency loads for a period of 18 hours. Beginning with fully charged batteries, what is the minimum allowable voltage of the batteries after the 18 hour discharge period assuming a nominal voltage rating of 24 VDC and operating at rated capacity.	16.0 VDC	18.8 VDC	**21.1 VDC**	22.8 VDC
1208	Suppose a cargo vessel of 1600 gross tons or more is fitted with emergency storage batteries for the purpose of supplying emergency lighting and power. According to 46 CFR, Subchapter J (Electrical Engineering), the capacity of the storage batteries is such that they should be able to successfully power the emergency loads for a period of 18 hours. What is the maximum initial voltage of the batteries allowable at the beginning of the 18 hour discharge period assuming a nominal voltage rating of 24 VDC.	22.8 VDC	24 VDC	**25.2 VDC**	26.4 VDC

ID #	Question	Choice A	Choice B	Choice C	Choice D
1209	Suppose it is desired to connect a dual voltage three phase squirrel cage induction motor for low volts, but it is undetermined whether the nine-lead motor is internally configured for wye or delta configuration. Using an ohmmeter, the motor itself with leads disconnected, and the illustration as a guide, what statement is true?	**If leads "7", "8", and "9" have continuity across each other, the motor is "wye" configured. Without continuity, the motor is "delta" configured.**	If leads "7", "8", and "9" have continuity across each other, the motor is "delta" configured. Without continuity, the motor is "wye" connected.	If leads "4", "5", and "6" have continuity across each other, the motor is "wye" configured. Without continuity, the motor must be "delta" connected.	If leads "4", "5", and "6" have continuity across each other, the motor is "delta" configured. Without continuity, the motor must be "wye" connected.
1210	Suppose the bearings of an electrical generator are failing more frequently than expected and the lubricating oil is sludging. What should be done?	check the connections to the output leads	**check the bearing insulating block on one end of the unit**	replace the bearing with a sealed roller type	replace the thrust bearing of the prime mover
1211	The "soft" insulation of practically all electrical machinery uses asphalt binders which reduces the potentially harmful effects of vibration. What property associated with this type of insulation must be kept in mind?	resistance to moisture absorption	**tendency to absorb moisture**	asbestos composition	tendency to crack
1212	The 24 volt DC bus on the emergency switchboard is used to supply power to what system or equipment?	**general alarm and vital communication systems**	steering gear power unit motors	main lighting system	propulsion engine lube oil pump motors
1213	The amplifier as shown in figure "A" of the illustration has what type of feedback network?	positive feedback also known as degenerative feedback	negative feedback also known as degenerative feedback	**positive feedback also known as regenerative feedback**	negative feedback also known as regenerative feedback
1214	The amplifier as shown in figure "B" of the illustration has what type of feedback network?	positive feedback also known as degenerative feedback	**negative feedback also known as degenerative feedback**	positive feedback also known as regenerative feedback	negative feedback also known as regenerative feedback
1215	The apparent power supplied to a motor is six kilovoltamps at 120 volts. What is the impedance of the motor?	0.05 ohms	0.50 ohms	**2.40 ohms**	24.00 ohms
1216	The arc resulting from the tripping of a circuit breaker is prevented from damaging the contacts. How is this done?	designing the contacts to open slowly	**directing the arc into an arc chute**	an inverse timed thermal trip for short circuit currents	instantaneous magnetic trip for overload currents
1217	The capacity of a storage battery is measured in what units?	volts	**ampere-hours**	farads	amps
1218	The characteristics of the device shown in figure "8" of the illustration includes a stable voltage and low current while operating. Because of this, it can be suitably used in what type of circuit?	**switching and timing circuits**	class A and B amplifiers	DC power supplies	SCR power circuits

ID #	Question	Choice A	Choice B	Choice C	Choice D
1219	The circuit illustrated in figure "A" represents a ground detecting system for a single phase AC system. If bus B is grounded as indicated, what will be the indication of a ground?	**Lamp A is brighter than lamp B before the test pushbutton is depressed and they are equally bright after the test pushbutton is depressed**	Lamp B is brighter than lamp A before the test pushbutton is depressed and they are equally bright after the test pushbutton is depressed	Both lamps are equally bright before the test pushbutton is depressed and lamp A is brighter than lamp B after the test pushbutton is depressed	Both lamps are equally bright before the test pushbutton is depressed and lamp B is brighter than lamp A after the test pushbutton is depressed
1220	The clamp-on AC ammeter consists essentially of a split-core and a rectifier-type instrument connected to the secondary winding of a particular type of transformer. Which type is used?	potential transformer	control transformer	**current transformer**	reactance transformer
1221	The component labeled 'CR1' in the circuit shown in the illustration serves what functional purpose?	it varies its anode/cathode polarity depending on 'RL' current	it rectifies the varying voltage from the collector of 'Q1'	it acts as a low capacitive reactance to smooth ripple	**it establishes a constant reference voltage for the base of 'Q1'**
1222	The conversion of constant frequency power into adjustable frequency power in a modern AC propulsion drive system is commonly achieved through the use of what electronic system components?	transformers and resistors	**rectifiers and thyristors**	rheostats and resistors	potentiometers and diodes
1223	The conversion of the throttle command voltage to the signal necessary to achieve the desired shaft RPM is accomplished by what circuit?	**ahead or astern function generator of the throttle control circuit**	feedback resistor of the summing amplifier circuit	operational amplifiers in the autorotation circuit	long time constant amplifier circuit
1224	The counter EMF of a DC motor is maximum when the _____.	**motor is at rated speed**	armature is not turning	motor is almost up to rated speed	armature has just begun to turn
1225	The current at which a magnetic-type overload relay tends to trip may be decreased by raising the plunger further into the magnetic circuit of the relay. What effect does this action have?	reduces magnetic pull on the plunger and requires more current to trip the relay	reduces magnetic pull on the plunger and requires less current to trip the relay	increases magnetic pull on the plunger and requires more current to trip the relay	**increases magnetic pull on the plunger and requires less current to trip the relay**
1226	The device shown in figure "C" of the illustration is represented by which schematic symbol?	**1**	3	6	9
1227	The device that most commonly utilizes the principle of electromagnetic induction by mutual inductance is what?	diode	**transformer**	transistor	rheostat

ID #	Question	Choice A	Choice B	Choice C	Choice D
1228	The diagram shown in the illustration demonstrates one of the useful properties of an 'RC' time constant circuit. In terms of the charging and discharging cycles of "C1", what statement is true?	**"C1" charges slowly at low current with a high "R1" value and discharges rapidly at a high current with a low "R1" value**	"C1" charges slowly at a high current with a low "R1" value and discharges rapidly at a low current with a high "R1" value	"C1" charges rapidly at a low current with a high "R1" value and discharges slowly at a high current with a low "R1" value	"C1" charges rapidly at a high current with a high "R1" value and discharges slowly at a low current with a low "R1" value
1229	The 'dielectric constant' is a numerical value indicating the effectiveness of a dielectric material in comparison to that of a standard. On what material is the standard based?	paper or cloth	glass or mica	plastic or Teflon	**dry air or a vacuum**
1230	The difference between the synchronous speed of an three phase induction motor and its operating speed is called slip, which would be given in RPM. What is another way that slip can be expressed?	**as a percent of synchronous speed**	as the difference between no load and full load amperage	as the difference between no load and full load torque	as the difference between no load and full load horsepower
1231	The distance between a generator and its load is 100 feet. What would be the approximate total voltage drop across a two wire supply cable if the current were 5.5 amperes and the resistance of the wire were 2.525 ohms per 1,000 feet?	0.5 volts	1.38 volts	1.90 volts	**2.77 volts**
1232	The electrical diagram shown in figure B of the illustration represents what type of DC motor?	series-wound DC motor	shunt-wound DC motor	**compound-wound DC motor**	permanent magnet DC motor
1233	The electrical energy necessary to power a sound-powered telephone's small vibrating bell is obtained from what power source?	the emergency batteries for the general alarm	**each station's hand-cranked generator**	the emergency switchboard	normal 115 volt DC supplies
1234	The electrical energy necessary to transmit a person's voice over a sound-powered telephone circuit is obtained from what energy source?	dry cell batteries	the ship's service switchboard	the emergency switchboard	**the speaker's voice**
1235	The electrician reports to you that he has obtained low (but above 1 megohm) megger readings on the windings of a deck winch motor. Upon checking the records of that motor, you find the readings have consistently been at that level for the last six years. What should be your recommendation?	that the motor be replaced	that the windings be dried	that the windings be cleaned	**that the readings are acceptable**
1236	The electrolyte in a lead-acid storage battery consists of distilled water and _____.	hydrogen chloride	calcium chloride	**sulfuric acid**	muriatic acid
1237	The electrolyte used in a nickel-cadmium battery is distilled water and what other substance?	diluted sulfuric acid	**potassium hydroxide**	lead sulfate	zinc oxide
1238	The existing resistance of a conductor is dependent upon its length, cross-sectional area, and what other factors?	inductive reactance and insulation	material and insulation	capacitive reactance and material	**material and temperature**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1239	The final step in testing a circuit for a ground involves the use of a megohmmeter. If a switch or cable is grounded what will be the indication as revealed by a megohmmeter reading?	**'zero'**	infinity	steady in the high range	unsteady in the low range
1240	The FIRST requirement for logical troubleshooting of any system requires the troubleshooter to do what?	collect all available data on a casualty	**recognize what is normal operation**	identify the probable cause of a symptom	isolate the faulty component
1241	The following stator-to-rotor air gap clearance readings were obtained from a horizontally mounted, bilge pump, induction motor, equipped with sleeve bearings: FWD END AFT END Top .045 .049 Right Side .045 .047 Left Side .045 .047 Bottom .045 .041 Which of the following statements is true?	**The aft bearing should be replaced.**	Shims should be removed from the aft bearing.	The forward bearing should be lowered.	The aft bearing should be lowered.
1242	The following stator-to-rotor air gap clearance readings were obtained from a horizontally mounted, bilge pump, induction motor, equipped with sleeve bearings: FWD END AFT END Top .045 .049 Right Side .045 .047 Left Side .045 .047 Bottom .045 .041 Which of the following statements is true?	**The aft bearing should be realigned or replaced.**	Shims should be removed from the aft bearing.	The forward bearing should be lowered.	The aft bearing should be lowered.
1243	The governor control switch of an alternator is moved to the 'raise' position. What will be the effect of this action?	**raise the no-load speed setting of the governor**	raise the percentage of speed droop	lower the no-load speed setting of the governor	lower the percentage of speed droop
1244	The ground indicating light on the main electrical switchboard is indicating a ground. What is the best procedure for locating the grounded circuit?	trace the circuit paths while looking for burned spots	check circuit resistances with a megohmmeter connected between the grounded line and the distribution panel framework	**open the circuit breakers on the distribution panel, one at a time, until the lights no longer indicate a ground**	check all circuits for continuity

ID #	Question	Choice A	Choice B	Choice C	Choice D
1245	The illustrated motor fails to start and gives a loud hum when the start button is depressed, what should then be your first action?	disassemble the motor to fix the centrifugal switch so the start windings will be energized	**push the stop button to deenergize the "M" coil**	reset the thermal overload	hold the "M" contactor closed by hand while wearing electrical safety gloves to get motor started
1246	The individual 12 volt lead-acid batteries, when connected as shown in the illustration, as a battery bank would produce how many volts?	**12 volts**	24 volts	36 volts	48 volts
1247	The individual 12 volt, 100 ampere-hour lead-acid batteries, when connected as shown in the illustration, as battery bank would produce what voltage and capacity?	12 volts, 100 ampere-hours	**12 volts, 400 ampere-hours**	48 volts, 100 ampere-hours	48 volts, 400 ampere-hours
1248	The individual 6 volt lead-acid batteries, when connected as shown in the illustration, as a battery bank would produce how many volts?	**6 volts**	12 volts	18	24
1249	The instantaneous reduction in voltage of an AC generator, resulting from an increase in load and prior to the automatic voltage regulator correcting the situation, is called what?	voltage droop	voltage drop	**voltage dip**	voltage regulation
1250	The leads from a ohmmeter are attached to the leads of the opposite ends of an AC motor stator field coil. If a reading of infinity is obtained, what does this indicate?	**open field coil**	shorted field coil	grounded field coil	shunted field coil
1251	The life expectancy of electrical insulation, is approximately halved for an increased operating temperature of how many degrees Celsius?	**10°C**	25°C	50°C	100°C
1252	The motor fails to start on an attempted startup. With the start button depressed, a voltmeter reading between 1 and 5, as illustrated in figure "A", indicates line voltage available to the control circuit, what should be your next step in the troubleshooting process?	test the stop button for continuity and replace if necessary	insure that the disconnect switch (DS) is closed	**attempt to reset the overload relay and determine the cause of the overload if applicable**	test the contactor coil "M" for continuity and replace if necessary
1253	The motor starts when the start button in the illustration is pushed, but stops when the button is released. What is most likely the trouble?	an open in the stop button contact	an open "M" contactor coil	a corroded contact on the disconnect switch (DS) at 'L3'	**an open auxiliary "M" contact**
1254	The multiplier prefix 'giga' (G) such as used in "gigabytes" represents what multiplication factor?	thousand (10 to the 3rd power)	million (10 to the 6th power)	**billion (10 to the 9th power)**	trillion (10 to the 12th power)
1255	The multiplier prefix 'kilo' (k) such as used in "kilovolts" represents what multiplication factor?	**thousand (10 to the 3rd power)**	million (10 to the 6th power)	billion (10 to the 9th power)	trillion (10 to the 12 power)
1256	The multiplier prefix 'mega' (M) such as used in "megawatts" represents what multiplication factor?	thousand (10 to the 3rd power)	**million (10 to the 6th power)**	billion (10 to the 9th power)	trillion (10 to the 12th power)

ID #	Question	Choice A	Choice B	Choice C	Choice D
1257	The multiplier prefix 'micro' (Greek letter mu) such as used in "microamps" represents what multiplication factor?	thousandth (10 to the -3rd power)	**millionth (10 to the -6th power)**	billionth (10 to the -9th power)	trillionth (10 to the -12th power)
1258	The multiplier prefix 'nano' (n) such as used in "nanometers" represents what multiplication factor?	thousandth (10 to the -3rd power)	millionth (10 to the -6th power)	**billionth (10 to the -9th power)**	trillionth (10 to the -12th power)
1259	The multiplier prefix 'pico' (p) such as used in "picofarads" represents what multiplication factor?	thousandth (10 to the -3rd power)	millionth (10 to the -6th power)	billionth (10 to the -9th power)	**trillionth (10 to the -12th power)**
1260	The multiplier prefix 'tera' (T) such as used in "terabytes" represents what multiplication factor?	thousand (10 to the 3rd power)	million (10 to the 6th power)	billion (10 to the 9th power)	**trillion (10 to the 12th power)**
1261	The nominal closed-circuit voltage of one cell of a fully charged wet cell nickel-cadmium battery is approximately how many volts?	**1.2 volts**	1.5 volts	2.0 volts	3.0 volts
1262	The nominal open-circuit voltage of one cell of a fully charged lead-acid battery is approximately how many volts?	1.5 volts	**2 volts**	6 volts	12 volts
1263	The number of cycles per second occurring in AC voltage is known as what characteristic?	phase angle	**frequency**	wave form	half mode
1264	The prime mover of an AC two pole main propulsion generator drives the generator at 3600 RPM. If the main propulsion motor has 80 poles, what will be the propeller speed?	45 RPM	80 RPM	**90 RPM**	180 RPM
1265	The process, whereby electrons gain sufficient energy to be released from the surface of a thin, heated metal plate, is known as what type of emission?	photo electric emission	secondary emission	**thermionic emission**	regressive emission
1266	The progressive operation of the contactors marked "1A" through "4A" provide the winch hoist controller shown in the illustration with what functionality?	accumulation	dynamic braking	**acceleration**	regenerative braking
1267	The propulsion motor most often utilized in an ac drive system operating in the moderate to high power range is of what type?	squirrel cage induction type	**synchronous type with wound field**	wound rotor induction type	split phase induction type
1268	The purpose of the reverse power relay, provided on a ship's service alternator panel, is to trip the alternator circuit in the event of a very specific situation. What situation is this?	main circuit overload	high power transfer	generator overspeeding	**alternator motorization**
1269	The pushbutton on the handset of a ship's sound-powered telephone must be depressed in order to do what?	talk then released to listen	listen then released to talk	**both talk and listen**	ring the station being called
1270	The reading at "4" on the megger scale illustrated in figure "A" is what value?	7 thousand ohms	0.7 megohms	**7 megohms**	70 megohms

ID #	Question	Choice A	Choice B	Choice C	Choice D
1271	The resistance of most conducting materials will change as a result of temperature change. What will happen to the resistance of copper wire when the temperature increases?	decreases in a predictable way	**increases in a predictable way**	remains constant	changes in an unpredictable way
1272	The root mean square (RMS) value of a sine-wave current may also be expressed as what value?	average value	maximum value	**effective value**	instantaneous value
1273	The set point current at which a magnetic-type overload relay tends to trip may be increased by turning the dashpot in the 'lower' direction. What effect will this action have?	**reduces magnetic force on the plunger and requires more current to trip the relay**	reduces magnetic force on the plunger and requires less current to trip the relay	increases magnetic force on the plunger and requires more current to trip the relay	increases magnetic force on the plunger and requires less current to trip the relay
1274	The simple amplifier shown in figure "1" of the illustration is configured for what class of operation?	**class A**	class AB	class B	class C
1275	The simple amplifier shown in figure "2" of the illustration is configured for what class of operation?	class A	**class AB**	class B	class C
1276	The simple amplifier shown in figure "3" of the illustration is configured for what class of operation?	class A	class AB	**class B**	class C
1277	The simple amplifier shown in figure "4" of the illustration is configured for what class of operation?	class A	class AB	class B	**class C**
1278	The standard measuring unit of wire by its cross-sectional area, as used in American wire tables is measured how?	cubic mils	**circular mils**	square millimeter	cubic inch
1279	The stator-to-rotor air gap clearance in an induction motor should be periodically checked with a feeler gage. What is indicated if the gap clearance is excessive?	the condition of insulation resistance	axial misalignment of the rotor	**excessive wear of the bearings**	excessive hysteresis loss
1280	The term "volt" describes:	a rate of electron flow.	the resistance to current flow.	**an electrical potential difference.**	the transfer of circulating currents.
1281	The timer element of a reverse power relay cannot be energized unless what condition is met?	one generator is fully motorized	the movement of the disk is damped by a permanent magnet	**the power flow is the same as the tripping direction**	the power flow is the opposite to the tripping direction
1282	The torque produced by a DC motor armature is the multiplication product of two factors, one being the density of the magnetic flux which is dependent upon the field current. What is the other multiplication factor?	armature conductance	armature voltage drop	armature resistance	**armature current**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1283	The torque-speed and current-speed curves for a three-phase induction motor with a squirrel cage rotor are shown in figures "A" and "B" of the illustration. Which of the following statements is true concerning the depicted curves?	The starting current is nearly 1.5 times the normal full load current value.	The pull-up point on the torque curve is about 20% of the normal full load torque value.	Rated torque and rated current occur at approximately 20% slip.	**Starting current is approximately 4.75 times the normal full load current value.**
1284	The transformer diagram shown in figure "B" of the illustration represents what type of transformer?	**step down transformer with dual voltage secondary**	open delta transformer	autotransformer	Scott-connected transformer
1285	The transformer diagram shown in figure "C" of the illustration represents what type of transformer?	**tapped step down transformer**	open delta transformer	autotransformer	Scott-connected transformer
1286	The transistors in figure "A" of the illustrated circuit are connected using what type of coupling?	RC coupling	transformer coupling	**impedance coupling**	direct coupling
1287	The transistors in figure "A" the illustrated circuit are connected using what type of coupling?	RC coupling	transformer coupling	LC coupling	**direct coupling**
1288	The transistors in figure "B " of the illustrated circuit are connected using what type of coupling?	RC coupling	**transformer coupling**	LC coupling	direct coupling
1289	The transistors in figure "B" the illustrated circuit are connected using what type of coupling?	**RC coupling**	transformer coupling	LC coupling	direct coupling
1290	The true power indicated by a wattmeter depends on the current flow through the load, the magnitude of the voltage across the load, and what other factor?	**power factor of the load**	angle of coil displacement	inertia of the movable coil	high resistance from the load
1291	The true power indicated by the pointer movement of a wattmeter depends on the current flow through the load, the magnitude of the voltage across the load, and what other factor?	**power factor of the load**	angle of coil displacement	inertia of the movable coil	high resistance from the load
1292	The turns ratio of the step down transformer with dual voltage secondary as shown in figure "B" of the illustration is two to one (total). If 220 volts were applied to terminals 'H1' & 'H2', what would be indicated across 'X1' & 'X4' with 'X2' & 'X3' connected and isolated?	55 volts	**110 volts**	220 volts	440 volts
1293	The turns ratio of the step down transformer with dual voltage secondary as shown in figure "B" of the illustration is two to one (total). If 440 volts were applied to terminals 'H1' and 'H2', what would be measured across 'X1-X3' and 'X2-X4' assuming that the secondary windings are connected in parallel?	55 volts	**110 volts**	220 volts	880 volts

ID #	Question	Choice A	Choice B	Choice C	Choice D
1294	The turns ratio of the step down transformer with dual voltage secondary shown in figure "B" of the illustration is two to one (total). If 220 volts were applied to terminals 'H1' and 'H2', what would be measured across 'X3' and 'X4'?	**55 volts**	110 volts	440 volts	880 volts
1295	The turns ratio of the tapped step down transformer shown in figure "C" of the illustration is four to one and all taps are equally spaced. If 440 volts were applied between 'H1' and 'H4', what would appear across 'X1' and 'X4'?	**110 volts**	220 volts	440 volts	1760 volts
1296	The turns ratio of the tapped step down transformer shown in figure "C" of the illustration is four to one and all taps are evenly spaced. If 110 volts were applied to terminals 'X1' and 'X3', what would be measured across 'H1' and 'H2'?	37.5 volts	55 volts	**220 volts**	440 volts
1297	The turns ratio of the tapped step down transformer shown in figure "C" of the illustration is four to one and all taps are evenly spaced. If 110 volts were applied to terminals 'X1' and 'X3', what would be measured across 'H1' and 'H2'?	37.5 volts	55 volts	**220 volts**	440 volts
1298	The turns ratio of the tapped step down transformer shown in figure "C" of the illustration is four to one and all taps are evenly spaced. If 120 volts were applied to terminals 'H1' and 'H3', what would appear at 'X1' and 'X2'?	**15 volts**	30 volts	480 volts	960 volts
1299	The turns ratio of the tapped step down transformer shown in figure "C" of the illustration is four to one and all the taps are equally spaced. If 120 volts was measured across the secondary between 'X1' and 'X2', what voltage must be applied across 'H1' and 'H4'?	30 volts	120 volts	480 volts	**1440 volts**
1300	The turns ratio the tapped step down transformer shown in figure "C" of the illustration is four to one and all taps are evenly spaced. If 120 volts were applied to terminals 'H1' and 'H3', what would appear at 'X1' and 'X2'?	**15 volts**	30 volts	480 volts	960 volts
1301	The use of a high wattage soldering iron when soldering or desoldering components on a printed circuit board may cause which of the following faults to occur?	The flux may not spread evenly.	**The foil circuitry bonded to the board may separate from the surface.**	The solder may not harden properly.	The conductivity of the solder will decrease.
1302	The use of four diodes, in a full-wave bridge rectifier circuit, will have what functional purpose?	**convert alternating current to direct current**	allow a very high leakage current from the load	convert direct current to alternating current	offer high opposition to current in both directions
1303	The wet-cell storage batteries shown in the illustration are connected in what configuration?	compound	series	**parallel**	tandem

ID #	Question	Choice A	Choice B	Choice C	Choice D
1304	The Wheatstone bridge is a precision measuring instrument. Its operating principle is based on changes in what electrical parameter?	inductance	capacitance	**resistance**	amperage
1305	The when testing insulation resistance of electric equipment and machinery, ideally when should the insulation resistance be tested for the lowest normal insulation values?	**immediately after shutting down the machine**	every time the brush rigging is adjusted	immediately after starting up the machine	every 30 days whether the machine is in use or not
1306	The winch shown in the illustration operates in any of the positions with the master switch in the 'lower' direction, but will not 'hoist' in any of the master switch hoist speed positions. Which of the listed faults could be the cause?	Master switch contact 'MS 2' may have defective springs.	Master switch contact 'MS 3' may have defective springs.	**Master switch contact 'MS 4' may have defective springs.**	Master switch contact 'MS 5' may have defective springs.
1307	The winch shown in the illustration will operate normally in all speeds in both directions, with the exception that it will not accelerate into 'fifth point' hoist or 'fifth point' lower. What would be a possible cause?	master switch contact 'MS 7" fails to close	the contactor '5A' coil is open-circuited	**time delay relay '3T' coil is open-circuited**	master switch contacts "MS 8' are welded closed
1308	There are very specific rules that govern the testing of generators found in the appropriate publication incorporated by reference. According to 46 CFR, Subchapter J (Electrical Engineering), which agency publishes the rules for the construction and testing of generators.	Underwriter's Laboratories, Inc.	**American Bureau of Shipping**	manufacturer	ASME
1309	Three 12 volt, lead-acid, batteries connected in series will develop how many volts?	12 volts	24 volts	**36 volts**	48 volts
1310	Tightly knit metal braid wire can be used on a printed circuit board under what repair conditions?	where the wire braid is used as a heat sink during soldering operations	**where the wire braid is used to suck up the melted solder when disordering a joint**	where the wire braid is used to bridge across a crack in the printed wiring to correct an open circuit	under no circumstances is wire braid to be used on a printed circuit board
1311	Tightly knit metal braid wire can be used with a printed circuit board under what conditions?	conductor resistance is not a factor	**required to desolder components on the board**	electrically produced magnetic fluxes would cause inaccuracies in adjacent components	reactance in the circuit must be kept to a minimum
1312	To best determine the state of charge of a wet cell nickel-cadmium battery, what should you do?	measure the output amperage	**measure the voltage while under a load**	test the electrolyte specific gravity	use a ohm meter on the highest scale
1313	To check the three line fuses protecting a three-phase motor using a multimeter set up as a voltmeter, what should be done FIRST?	**place the starter in the 'stop' position**	make sure the motor is operating at full load to guard against a false reading	place the leads across the 'hot' ends of the fuses	place the leads across the bottom ends of the fuses

ID #	Question	Choice A	Choice B	Choice C	Choice D
1314	To conduct an in-circuit test of a transistor, what meter or tester should be used?	**voltmeter or transistor tester**	impedance meter	ohmmeter or transistor tester	wattmeter
1315	To determine if a stator coil on a AC generator is grounded, you should use a/an _____.	ammeter	voltmeter	magneto	**megger**
1316	To determine the state of charge of a wet cell nickel-cadmium battery, what should be done?	check the electrolyte with a hydrometer	use the constant specific gravity method	check no load voltage	**check voltage under nominal load**
1317	To effectively clean a commutator in good physical condition, what should be used?	trichloride ethylene	kerosene	**a canvas wiper**	a commutator stone
1318	To limit the current flow through a DC voltmeter to as low a value as possible, what is the moving coil circuit provided with?	**high series resistance**	high parallel resistance	series inductor	external shunt
1319	To minimize magnetic field interaction between electrical conductors in physical proximity, what is the best practice?	parallel and as close as possible to each other	at right angles and as close as possible to each other	parallel to and as far as practicable from each other	**at right angles and as far as practicable from each other**
1320	To perform an insulation resistance test of an individual electric motor winding, where should the megohmmeter leads be connected?	to opposite ends of the winding	the input line lead and to one end of the winding	**one end of the winding and to the frame of the machine**	the armature brush pigtail and to the input line lead
1321	To properly seat the brushes on a commutator or slip rings, what should be used?	**sand paper**	crocus cloth	diamond file	hack saw
1322	To properly use a clamp-on-type ammeter to check current flow, what must be done FIRST?	de-energize the circuit to allow connection of the instrument in series	**hook the jaws of the instrument around the insulated single conductor**	connect the voltage test leads to the appropriate terminals	short the test leads and calibrate the instrument to zero
1323	To protect the rotor of a motor disassembled for maintenance or overhaul, what should be done?	suspended by wire slings in one corner of the shop	stowed upright on its shaft	**supported by two "V" notched wood blocks**	returned to the frame as soon as the bearings are removed
1324	To provide its unique characteristics to analog circuits, the operational amplifier is made up of certain amplifier sections. Which of the following sequences represents the proper sequence of amplifier sections?	voltage amp, current amp and output amp	input amp, power amp and output amp	scaling amp, power amp and voltage amp	**differential amp, voltage amp and output amp**
1325	To remove an alternator operating in parallel with another unit from the main electrical bus, what must be done FIRST?	adjust the power factor on both units	set the desired voltage on the outgoing alternator	open the circuit breaker on the outgoing alternator	**remove the load from the outgoing alternator**
1326	To repair a small electrical motor that has been submerged in saltwater, what should be done?	**wash it with fresh water and apply an external source of heat**	renew the windings	send it ashore to an approved service facility	rinse all electrical parts with a methyl chloride cleaning solvent and then blow dry the motor with compressed air

ID #	Question	Choice A	Choice B	Choice C	Choice D
1327	To safely measure current with a DC milliammeter, how is the meter connected?	**in series with the load of the circuit**	in parallel with the load of the circuit	with internal shunts only	without regard to polarity
1328	To test fuses in an energized circuit, what testing apparatus or meter should be used?	continuity tester	megohmmeter	**voltmeter**	resistance meter
1329	To test the state of charge of a nickel-cadmium battery, what should be used?	ammeter	**voltmeter**	hydrometer	potentiometer
1330	Two 100 watt light bulbs rated at 100 volts are connected in parallel across a 100 volt power supply. What will be the total power consumed by the two bulbs?	50 watts	100 watts	**200 watts**	equal to the product of the amperes times the voltage in each branch
1331	Two AC generators are operating in parallel and both are equipped with automatic voltage regulators. While standing watch, one generator is noted as having a greater lagging kvar value. In order to equalize the kvars between the generators manually, what should be done?	increase the speed of the generator with the largest kvar while decreasing the other generator speed	decrease the speed of the generator with the largest kvar while increasing the other generator speed	increase the voltage of the generator with the largest kvar while decreasing the other generator voltage	**decrease the voltage of the generator with the largest kvar while increasing the other generator voltage**
1332	Two AC generators of the same capacity are operating in parallel. One with a zero speed droop setting and the other with a 5% speed droop. If its capacity is not exceeded, what will be the characteristic of the unit whose governor has the zero speed droop setting?	it will assume the smaller share of the load	**it will maintain the frequency of the system**	it will have poor sensitivity characteristics	it will have poor power response
1333	Two contributors of electronic console failures are heat and vibration. To combat some of their effects, what should be included in performing preventive maintenance procedures?	systematic rotation of circuit cards with those from spares to allow component cooling	**periodic changing or cleaning of console ventilation and control room air conditioning filters**	daily inspection of console foundation bolts	unplugging of all circuit cards and reseating on a daily basis
1334	Two paralleled alternators are operating near rated load. If one trips out mechanically resulting in a reverse power trip, which of the listed actions should be taken FIRST?	Restart the tripped machine immediately.	**Strip the board of all non-vital circuits.**	Start the emergency generator.	Transfer all vital loads to the emergency bus.
1335	Under normal conditions, how is the speed of a two-speed squirrel cage induction motor changed?	frequency of the applied voltage	resistance in the rotor circuit	**number of field poles**	amplitude of the applied voltage
1336	Under normal conditions, storage batteries used for starting the emergency diesel generator are maintained in a charged state by which of the following methods?	**Trickle charging**	Fast charging	Equalizing charge	Reverse charging
1337	Under what circumstance would a hand-held portable phase sequence indicator be used should the main switchboard mounted fixed phase sequence indicator be inoperative?	installing a new synchroscope	**preparing to make the shore power connection**	replacing a defective solenoid	paralleling alternators

ID #	Question	Choice A	Choice B	Choice C	Choice D
1338	Under what conditions is the shore power circuit breaker closed?	only when the ship's generators have been directly paralleled to those on shore	only in a shipyard	only if a quick disconnect coupling is used	**only when the ship's generators have been removed from the bus**
1339	Under which of the following conditions will a lead-acid battery be given a 'test discharge'?	**To determine the battery's capacity.**	To determine the battery's specific gravity.	To determine the battery's state of charge.	To determine the battery's plate composition.
1340	Under which of the listed conditions can the engine room retake the throttle control from the bridge of an automated vessel?	**Any time it is deemed necessary.**	Only with the master's permission.	After a 10 minute delay to the input command.	Only after the throttle has been placed in stop.
1341	Undervoltage trips are frequently installed on switchboard circuit breakers for what reason?	trip out generators in the event of severe arcing or sparking	trip out generators when there is reversal of power in the main circuit	trip out the breaker if the generator overspeeds by 5%, but continues to run	**trip out the generator when there is insufficient voltage being delivered to distribution circuits**
1342	Universal motors will operate on AC or DC current. In what application is this type of motor generally?	**portable tools**	large pump motors	turbo electric main motors	forced draft fans
1343	Unnecessary and frequent applications of insulating varnish to the generator stator windings to repair defective insulation may have what detrimental effect?	**improper heat dissipation**	deficient air gap clearance and eventual damage to the casing	failure of the rectifier assembly	shorting out the line leads
1344	Upon failure of the normal power supply, by what means is the emergency generator is placed on the line and connected to the emergency bus?	bus tie feeder	**automatic bus transfer device**	line connection feeder	power failure alarm bus
1345	Upon failure of the normal power supply, how is the emergency generator placed on the line to feed power to the emergency bus?	main bus tie feeder	**automatic bus transfer device**	line connection feeder	power failure alarm bus
1346	Upon failure of the ships normal electrical power supply, by means of what device does the emergency generator supply power to the emergency switchboard, but not the main switchboard?	main lighting transformer	**automatic bus transfer switch**	main switchboard bus	power failure alarm bus
1347	Using the analogy of a piping system, what piping system component is similar in function to a rectifier diode?	trap	regulating valve	**check valve**	filter or strainer

ID #	Question	Choice A	Choice B	Choice C	Choice D
1348	Using the illustrated catalog number selection chart, determine the correct catalog number for a motor contactor that meets the following selection criteria: a 3-pole, NEMA non-reversing contactor with an open enclosure rated at 18 continuous amperes, fitted with an operating coil rated at 208 VAC/60Hz.	CE15BN3E	AN15BN3E	CN15BN3E5G020	**CN15BN3E**
1349	Using the illustrated catalog number selection chart, determine the correct catalog number for a motor starter that meets the following selection criteria: a 3-pole, vertically mounted, NEMA multi-speed starter with an open enclosure rated at 27 continuous amperes, fitted with a bimetallic overload relay and an operating coil rated at 240 VAC/60Hz.	**AN706DNVB**	AN706DNVB5E045	CN706DN3B	AN706DNVT
1350	Using the illustrated catalog number selection chart, determine the correct catalog number for a motor starter that meets the following selection criteria: a 3-pole, vertically mounted, NEMA non-reversing starter with an open enclosure rated at 90 continuous amperes, fitted with an electronic overload relay with a standard feature set and an operating coil rated at 120 VAC/60Hz.	AN19AN0A5E005	**AN19KNVA5E100**	AN59GNVT5G100	AE19GNVB5G100
1351	Using the illustrated catalog number selection chart, determine the correct catalog number for a motor starter that meets the following selection criteria: a 3-pole, vertically mounted, NEMA reversing starter with an open enclosure rated at 45 continuous amperes, fitted with an electronic overload relay with a ground fault feature set and an operating coil rated at 24 VAC/60Hz.	AN19AN0A5E005	CN16GNVT5G045	**AN59GNVT5G045**	AE19GNVB5G045
1352	Using the illustrated chart giving the boiling point of moisture at various depths of vacuum, with an ambient temperature of 72 °F, what depth of vacuum would be associated with the BEST chance of achieving a dehydration evacuation with a deep vacuum pump?	28.75" Hg gauge or 31,750 microns of Hg absolute	29" Hg gauge or 25,400 microns of Hg absolute	29.20" Hg or 20,320 microns of Hg absolute	**29.99" Hg or 254 microns of Hg absolute**
1353	Using the illustrated vacuum equivalents chart as a reference, which of the following vacuums listed represents the deepest vacuum?	0" Hg gauge	1" Hg absolute	10 mm Hg absolute	**1000 microns Hg absolute**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1354	Using the motor performance curves shown in the off standard-frequency graph of the illustration, what would be the impact of operating a motor significantly below its rated frequency?	**The motor RPM would be lower than normal.**	The starting current will be lower than normal.	The full load current will be lower than normal.	The starting and breakdown torque will be lower than normal.
1355	Using the motor performance curves shown in the off standard-voltage graph of the illustration, what would be the full load current of a 450 VAC motor rated at 75 amperes of current at full load if the motor supply voltage is 405 VAC?	66.75	72.0	78.0	**83.25**
1356	Using the motor performance curves shown in the off standard-voltage graph of the illustration, what would be the impact of operating a motor significantly below its rated voltage?	The starting current would be higher than normal.	The starting and breakdown torque would be higher than normal.	The full load current would be lower than normal.	**The full load current would be higher than normal.**
1357	Using the portable harmonic analyzer shown in figure "A", if the clamp-on test lead is connected as shown in figure "C" of the illustration, what is being measured?	the harmonic content of the voltage at a service entrance	the harmonic content of the current of a bundle of conductors at a service entrance	**the harmonic content of the current of a single conductor at a service entrance**	the harmonic content of current leakage to hull ground
1358	Using the portable harmonic analyzer shown in figure "A", if the test leads are connected as shown in figure "D" of the illustration, what is being measured?	**the harmonic content of the voltage at the primary terminals of a delta-to-wye power transformer**	the harmonic content of the voltage at the secondary terminals of a delta-to-wye power transformer	the harmonic content of the current at the primary terminals of a delta-to-wye power transformer	the harmonic content of the current at the secondary terminals of a delta-to-wye power transformer
1359	Using the standard method of controlling the output voltage of a 440 volt, 60 Hz, AC generator, by what means is this accomplished?	varying the prime mover speed droop	varying the number of poles	**varying the alternator field excitation**	varying the load on the alternator
1360	Using the temperature correction factor for the winding insulation temperature graph illustrated what would be the correction factor and the corrected temperature to 40 degrees C for a motor with a insulation resistance of 4 megohms measured at 30 degrees C?	The temperature correction factor is 2 and the corrected resistance is 8 megohms at 40 degrees C.	The temperature correction factor is 2 and the corrected resistance is 2 megohms at 40 degrees C.	The temperature correction factor is 0.5 and the corrected resistance is 8 megohms at 40 degrees C.	**The temperature correction factor is 0.5 and the corrected resistance is 2 megohms at 40 degrees C.**
1361	Using the temperature correction factor for the winding insulation temperature graph illustrated what would be the correction factor and the corrected temperature to 40 degrees C for a motor with a insulation resistance of 4 megohms measured at 50 degrees C?	**The temperature correction factor is 2 and the corrected resistance is 8 megohms at 40 degrees C.**	The temperature correction factor is 2 and the corrected resistance is 2 megohms at 40 degrees C.	The temperature correction factor is 0.5 and the corrected resistance is 8 megohms at 40 degrees C.	The temperature correction factor is 0.5 and the corrected resistance is 2 megohms at 40 degrees C.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1362	Using the temperature correction factor for the winding insulation temperature graph illustrated what would be the correction factor and the corrected temperature to 40 degrees C for a motor with a insulation resistance of 8 megohms measured at 20 degrees C?	The temperature correction factor is 4 and the corrected resistance is 2 megohms at 40 degrees C.	The temperature correction factor is 4 and the corrected resistance is 32 megohms at 40 degrees C.	**The temperature correction factor is 0.25 and the corrected resistance is 2 megohms at 40 degrees C.**	The temperature correction factor is 0.25 and the corrected resistance is 32 megohms at 40 degrees C.
1363	Using the temperature correction factor for the winding insulation temperature graph illustrated what would be the correction factor and the corrected temperature to 40 degrees C for a motor with a insulation resistance of 8 megohms measured at 60 degrees C?	The temperature correction factor is 4 and the corrected resistance is 2 megohms at 40 degrees C.	**The temperature correction factor is 4 and the corrected resistance is 32 megohms at 40 degrees C.**	The temperature correction factor is 0.25 and the corrected resistance is 2 megohms at 40 degrees C.	The temperature correction factor is 0.25 and the corrected resistance is 32 megohms at 40 degrees C.
1364	Using the trouble analysis chart and faults table provided in the illustration, if the gyrocompass was malfunctioning, but no fault codes are present on the display unit, what is most likely the problem if the DC/DC converter LED status indicator is functioning properly, but the CPU LED status indicator is not blinking?	**The CPU assembly is malfunctioning..**	The AC/DC power supply is malfunctioning.	The DC/DC converter is malfunctioning.	Ship's power is not available.
1365	Using the trouble analysis chart and faults table provided in the illustrations, if the adaptive digital steering system was malfunctioning, and the fault code 41 (SPEED LOG ERROR) is displayed, what corrective action should be performed FIRST?	**Check message string output by the source.**	Check connection.	Replace the ADS assembly.	Replace the CPU assembly.
1366	Using the trouble analysis chart and faults table provided in the illustrations, if the adaptive digital steering system was malfunctioning, and the fault code 41 (SPEED LOG ERROR) is displayed, what corrective action should be performed LAST?	Check message string output by the source.	Check connection.	Replace the ADS assembly.	**Replace the CPU assembly.**
1367	Using the trouble analysis chart and faults table provided in the illustrations, if the adaptive digital steering system was malfunctioning, and the fault code 42 (SPEED LOG ERROR) is displayed, what corrective action should be performed FIRST?	**Check speed log source (log data strings from source).**	Check speed log wire connections.	Replace the DC/DC assembly.	Replace the CPU assembly for pulse log.
1368	Using the trouble analysis chart and faults table provided in the illustrations, if the adaptive digital steering system was malfunctioning, and the fault code 42 (SPEED LOG ERROR) is displayed, what corrective action should be performed LAST?	Check speed log source (log data strings from source).	Check speed log wire connections.	Replace the DC/DC assembly.	**Replace the CPU assembly for pulse log.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1369	Using the trouble analysis chart and faults table provided in the illustrations, if the adaptive digital steering system was malfunctioning, but no fault codes are present on the display unit, what is most likely the problem if the DC/DC converter LED status indicator is functioning properly and the CPU LED status indicator is blinking?	The CPU assembly is malfunctioning..	The AC/DC power supply is malfunctioning.	The DC/DC converter is malfunctioning.	**The rudder servo amplifier is malfunctioning.**
1370	What application would the switchboard instrumentation panel shown in the illustration best be suited for?	**main AC generator**	main DC generator	variable frequency MG set	electric arc welder controller
1371	What are some common basic applications for the operational amplifier?	counting, pulsing and clocking amplifiers	**summing, scaling and difference amplifiers**	step-up, step-down and rectifying amplifiers	radio frequency amplifiers
1372	What are the operating characteristics of a stepdown potential transformer in terms of the secondary load?	reduced voltage and reduced current	**reduced voltage and increased current**	reduced current and increased voltage	reduced power (kVA)
1373	What are the operational characteristics of the permanent split capacitor motor shown in figure "C" of the illustration?	**The motor is non-reversible and multi-speed, configured for low speed.**	The motor is reversible and multi-speed, configured for low speed.	The motor is non-reversible and multi-voltage, configured for low volts.	The motor is reversible and multi-voltage, configured for low volts.
1374	What are the operational characteristics of the shaded pole motor shown in figure "D" of the illustration?	**The motor is non-reversible and multi-speed, configured for low speed.**	The motor is reversible and multi-speed, configured for low speed.	The motor is non-reversible and multi-voltage, configured for low volts.	The motor is reversible and multi-voltage, configured for low volts.
1375	What are the operational characteristics of the split phase motor shown in figure "A" of the illustration?	The motor is non-reversible and dual-voltage, configured for high volts.	The motor is reversible and dual-voltage, configured for high volts.	The motor is non-reversible and dual-voltage, configured for low volts.	**The motor is reversible and dual-voltage, configured for low volts.**
1376	What are the operational characteristics of the split phase motor shown in figure "B" of the illustration?	The motor is non-reversible and dual-voltage, configured for high volts.	**The motor is reversible and dual-voltage, configured for high volts.**	The motor is non-reversible and dual-voltage, configured for low volts.	The motor is reversible and dual-voltage, configured for low volts.
1377	What are the operational characteristics of the two alternators with the speed-droop curves shown in figure "A" of the illustration?	machine "A" and machine "B" are both droop machines	machine "A" and machine "B" are both isochronous machines	**machine "A" is a droop machine, while machine "B" is an isochronous machine**	machine "A" is an isochronous machine, while machine "B" is a droop machine
1378	What are the operational characteristics of the two alternators with the speed-droop curves shown in figure "B" of the illustration?	**machine "A" and machine "B" are both droop machines of equal droop**	machine "A" and machine "B" are both isochronous machines	machine "A" is a droop machine, while machine "B" is an isochronous machine	machine "A" is an isochronous machine, while machine "B" is a droop machine

ID #	Question	Choice A	Choice B	Choice C	Choice D
1379	What are the purposes of the inductor coil "L" and the capacitor "C" respectively of the three phase controlled rectifier as illustrated in figure "F" of the illustration?	the inductor coil smoothes out voltage and the capacitor smoothes out current	**the inductor coil smoothes out current and the capacitor smoothes out voltage**	the inductor coil and capacitor both smooth out current	the inductor coil and capacitor both smooth out voltage
1380	What can a typical common analog or digital multimeter be used to measure?	**voltage, resistance, and current**	voltage, frequency, and current	frequency, current, and resistance	voltage, power, and current
1381	What can be the cause of excessive heat or burning contacts in an operating motor controller?	burned out operating coil	**loose connections or low contact pressure**	high ambient temperature	low motor starting torque
1382	What can be used to test for a suspected 'open' in a DC motor field winding?	potentiometer	**ohmmeter**	wattmeter	ammeter
1383	What can cause excessive sparking of D.C. motor brushes? I. Improperly seated brushes II. Improperly set brush rigging	I only	II only	**Either I or II**	Neither I nor II
1384	What can cause premature failure of grease-lubricated ball bearings as used in electric motor applications?	failure to warm up an electric motor at no load before bringing it up to operating speed and load	**failure to maintain proper shaft or pulley alignment or drive belt tension as applicable**	greasing the bearing so that the bearing cavity is only one third full	greasing the bearing at periodic intervals as specified by the manufacturer
1385	What can cause the pitting or welding of controller contacts?	excessive spring pressure	**insufficient contact pressure**	high ambient temperature	low ambient temperature
1386	What can cause uneven wear of the commutator surface on a direct current generator?	rapid change in load	excessive operation at light load	**incorrect brush staggering**	unequal pole spacing
1387	What can clogged ventilation ducts in a D.C. motor lead to?	reduced voltage	reduced current	increased resistance	**overheating**
1388	What can insufficient brush pressure on a DC motor cause?	generator overload	excess residual magnetism	water vapor absorption	**sparking of the brushes**
1389	What causes the rotor of a synchronous motor to operate in synchronism with the rotating field?	the amortisseur (damper) windings	**the rotor is magnetically locked into step with the rotating magnetic field by the excitation current**	the field strength varies directly with rotor slip	the stator flux rotates in the opposite direction
1390	What circumstance has the greatest detrimental effect on idle electrical equipment?	loss of residual magnetism	**absorption of moisture in the insulation**	insulation varnish flaking or cracking	dirt collecting on the windings
1391	What circumstance will cause electrical machinery insulation to break down more rapidly than would normally be the case?	low loading of motors and generators	frequent megger testing	**high temperatures and vibration**	high operating frequencies

ID #	Question	Choice A	Choice B	Choice C	Choice D
1392	What condition associated with a lead-acid battery cell can cause the plates to partially short-out and cause the cell to fail to hold a charge.	lime accumulation on both the positive and negative terminal posts	dirty or acid-wet tops and sides of batteries	**accumulation of sediment within the cells due to excessive overcharging and discharging**	sulfation of the plates due to consistent undercharging or leaving the battery in a discharged state
1393	What controls rudder movement when the Operation Selector Switch shown in figure "A" of the illustration is in the "Controller" position?	ship's steering wheel	**non-followup controller**	gyro-compass	rate of turn signal
1394	What could cause a fuse to blow?	tight fuse holder clips	extremely low temperature surroundings	**loose or corroded fuse holder clips**	oversized fuse in terms of amp rating
1395	What could cause a very slow, but continual loss of electrolyte level from the cells of a storage battery?	**evaporation of the water**	too low a charging rate	the specific gravity being higher than normal	one or more filler caps installed too tightly
1396	What current is will be drawn by two 75 watt lamps and one 40 watt lamp when connected in parallel to a 120 volt power source?	0.161 amperes	0.631 amperes	**1.583 amperes**	6.199 amperes
1397	What damage may occur to the components of a winch master control switch, if the cover gasket becomes deteriorated?	Overheating of the winch motor.	Contamination of lube oil.	Sparking at the winch motor brushes.	**Rapid corrosion of switch components.**
1398	What determines the direction of rotation of an AC induction motor?	determined as the opposite of the direction of the rotating field	**determined as the same as the direction of the rotating stator field**	determined by the number of poles being even or odd	determined by the direction of the staggering of the brushes
1399	What determines the division of kilowatt load between two paralleled alternators?	amount of field excitation to the leading machine	**speed droop characteristics of the governors**	amount of field excitation to the lagging machine	number of field poles per alternator
1400	What determines the division of kilowatt load between two paralleled alternators?	amount of field excitation of the leading machine	**load-speed characteristics of the governors**	amount of field excitation to the lagging machine	type of alternator
1401	What determines the power factor of an electrical distribution system being supplied by a single AC generator?	**components of the connected load**	prime mover speed	output frequency	generator's rated voltage
1402	What device can be used to check the calibration of a circuit breaker?	500 volt megohmmeter	**portable low voltage high current testing unit**	standard digital multimeter	clamp-on voltmeter
1403	What device is used so that the kilowatt load sharing can be adjusted on paralleled generators?	field rheostat	**governor control**	automatic voltage regulators	hand tachometer
1404	What devices maintains equal power factors on paralleled AC generators automatically?	**voltage regulators**	reverse power relays	reverse current relays	governor speed control switches
1405	What does component labeled "C" shown in the illustration represent?	sealed junction box	**bell**	buzzer	shunt

ID #	Question	Choice A	Choice B	Choice C	Choice D
1406	What does figure "C" of the illustration represent?	a synchronous transmission system with a single transmitter and two receivers each equipped with a single phase stator winding and a three phase rotor winding	a synchronous transmission system with two transmitters and a single receiver each equipped with a single phase stator winding and a three phase rotor winding	**a synchronous transmission system with a single transmitter and two receivers each equipped with a single phase rotor winding and a three phase stator winding**	a synchronous transmission system with two transmitters and a single receiver each equipped with a single phase rotor winding and a three phase stator winding
1407	What does it indicate when violent gassing from a lead-acid battery occurs while it is being charged?	the plate separators are grounded	the battery compartment ventilation is inadequate	the electrolyte specific gravity is too low	**the charging rate is too high**
1408	What does it mean when violent gassing occurs during charging of a lead-acid battery?	the plate separators are grounded	the cell voltages are excessive	the specific gravity in insufficient	**the charging rate is excessive**
1409	What does section "C" of the circuit shown in the illustration function as?	a voltage regulator	**a filter**	a rectifier	a voltage transformer
1410	What does the amount of voltage induced in the stator windings of a modern AC generator mainly dependent upon?	the number of field poles energized	the number of brushes associated with the commutator	**the strength of the rotating magnetic field**	the cross-sectional area of the stator windings
1411	What does the circuit shown in the illustration represent?	function generator	voltage regulator	**electronic overload relay**	oscillator
1412	What does the circuit shown in the illustration represent?	battery charging circuit	synchronous exciter	depth sounding unit	**cathodic protection system**
1413	What does the circuit shown in the illustration represent?	a waveform analyzer	a Wheatstone bridge	a magnetic amplifier	**regulated DC power supply**
1414	What does the component labeled "A" shown in the illustration represent?	a selectable holding coil arrangement	a 'fuse blown' indicator circuit	'reset' and 'trouble' lamps	**a handset with switch and voice elements**
1415	What does the component labeled "B" shown in the illustration represent?	bridge rectifier	selsyn motor	**hand-cranked generator**	shielded lamp
1416	What does the component labeled "D" shown in the illustration represent?	**station selector switch**	vibrating reed indicator	junction box	ring counter
1417	What does the drawing in the illustrated circuit represent?	a six phase half wave rectifier	a three phase half wave rectifier	**a three phase full wave rectifier**	a single phase full wave rectifier
1418	What does the electronic symbol of figure "10" represent?	triac thyristor	**diac trigger diode**	diode rectifier	zener diode
1419	What does the electronic symbol of figure "11" represent?	triac thyristor	diac trigger diode	**diode rectifier**	zener diode
1420	What does the electronic symbol of figure "13" represent?	triac thyristor	diac trigger diode	diode rectifier	**zener diode**
1421	What does the electronic symbol of figure "9" represent?	**triac thyristor**	diac trigger diode	diode rectifier	zener diode

ID #	Question	Choice A	Choice B	Choice C	Choice D
1422	What does the schematic symbol shown in figure "1" of the illustration represent?	a normally open momentary contact pushbutton switch	**a normally closed momentary contact pushbutton switch**	a normally open maintained contact pushbutton switch	a normally closed maintained contact pushbutton switch
1423	What does the schematic symbol shown in figure "2" of the illustration represent?	**a normally open momentary contact pushbutton switch**	a normally closed momentary contact pushbutton switch	a normally open maintained contact pushbutton switch	a normally closed maintained contact pushbutton switch
1424	What does the symbol in figure "1" shown in the illustration represent?	NPN bipolar junction transistor	**PNP bipolar junction transistor**	junction field effect transistor	silicon controller rectifier
1425	What does the symbol in figure "2" shown in the illustration represent?	**NPN bipolar junction transistor**	PNP bipolar junction transistor	junction field effect transistor	silicon controller rectifier
1426	What does the symbol in figure "3" shown in the illustration represent?	NPN bipolar junction transistor	PNP bipolar junction transistor	**junction field effect transistor**	silicon controller rectifier
1427	What does the symbol in figure "7" shown in the illustration represent?	NPN bipolar junction transistor	PNP bipolar junction transistor	junction field effect transistor	**silicon controller rectifier**
1428	What does the symbol labeled "OL" represent as shown in the power circuit on lines T1 and T3 to the motor as shown in figure "A" of the illustration?	non-renewable fusible link	overload relay normally closed contacts	overload relay magnetic coil	**overload relay thermal heater**
1429	What effect will decreasing the power source frequency have in a capacitive circuit?	**it will decrease the average current in the circuit**	it will not have any affect on the average current value	it will increase the average current in the circuit	it will not have any affect on the capacitive reactance
1430	What effect will increasing the power source frequency have in a capacitive circuit?	it will decrease the average current in the circuit	it will not have any affect on the average current value	**it will increase the average current in the circuit**	it will not have any affect on the capacitive reactance
1431	What equipment for modern SCR rectified DC propulsion drive systems is usually included in the package?	propulsion generators which produce DC power that is converted to AC power for the propulsion motor	propulsion generators which produce DC power that is directly delivered to the series wound DC propulsion motor	propulsion generators which produce AC power that is directly delivered to the synchronous AC propulsion motor	**propulsion generators which produce AC power that is converted to DC power for the shunt wound DC propulsion motor**
1432	What function does an equalizing connection between two compound-wound DC generators operating in parallel serve?	reverse the polarity of the incoming generator as the series field weakens	automatically equalize the power factors	reverse the direction of current in the series field of the incoming generator	**parallel the series fields of the generators**
1433	What functionality do the 'MS 1' contacts of the master switch shown in the illustration provide?	low voltage release	overload protection	**low voltage protection**	high power factor correction
1434	What functionality does a low-voltage protection circuit as used in electric motor starting equipment provide?	trip out the motor when the motor overspeeds due to low voltage	trip out the motor when the motor develops a short circuit due to low voltage	allow the motor to restart automatically on restoration of voltage without manually resetting	**prevent the motor from restarting automatically on restoration of voltage**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1435	What generator control system component controls the division of the kilowatt load between two AC generators operating in parallel?	voltage regulators	field rheostats	reverse power relays	**prime mover governors**
1436	What governor setting is directly related to the load sharing characteristics of two diesel alternators operating in parallel?	load limit	idle speed	speed limit	**speed droop**
1437	What governor settings are the load sharing characteristics of two diesel generators operating in parallel mostly dependent upon?	load limit settings	idle speed settings	speed limit settings	**speed droop settings**
1438	What happens to the current in a series circuit when the voltage remains constant and the resistance increases?	**decreases**	remains the same	increases	increases by the square
1439	What happens to the flow of current when the supply voltage remains constant and the resistance is changed in a circuit?	it changes proportionally with the change in resistance	it changes as a factor of the change in resistance squared	it remains unchanged regardless of the resistance	**it changes inversely proportional with the change in resistance**
1440	What happens to the power loss when the current flow in a power transmission line is halved?	it is halved	it is doubled	**it is divided by four**	it is quadrupled
1441	What happens to the power loss when the current flow through a power transmission line is doubled?	it is halved	it is doubled	**it is quadrupled**	it is divided by four
1442	What happens to the power loss when the current in a power transmission line is increased?	**it increases as the square of the current**	it decreases as the square root of the current	it remains the same, as it is independent of current flow	it increases in direct proportion as the current
1443	What is a common source of field excitation for synchronous motors?	a low voltage battery	a motor attenuator set	**a DC rectifier or exciter**	an AC supply
1444	What is a bus disconnect link used to isolate?	one bus bar from the ground detection system	**the generator circuit breaker from the bus**	different bus phases from the equalizer connection	positive and negative buses from the neutral
1445	What is a common technology for an electro tachometer for measuring motor speed as used for variable speed drives?	**small permanent magnet generator**	centrifugal force indicator	vibrating reed frequency indicator	shaft torque indicator
1446	What is a common type of protective covering used on electrical conductors?	plain paper	**rubber or plastic**	silver sheathing	babbitt sheathing
1447	What is a hydrometer used to measure?	**specific gravity of a battery electrolyte**	water pressure in a deck pipeline	amount of potable water a vessel is taking on	power developed by a salt water service pump
1448	What is a megohmmeter used to measure?	voltage	**insulation resistance**	capacitance	power

ID #	Question	Choice A	Choice B	Choice C	Choice D
1449	What is a purpose of the automatic bus transfer device shown in the illustration?	Provide power to the 450 VAC main bus from the emergency generator in the emergency mode.	Provide power to the 450 VAC emergency bus from the 450 VAC main bus in the emergency mode.	**Provide power to the 450 VAC emergency bus from the emergency generator in the emergency mode.**	Provide power to the 450 VAC main bus from the 450 VAC emergency bus in the emergency mode.
1450	What is a useful instrument for checking 3 phase A.C. motor performance by measuring possible unbalanced currents?	hand or battery-operated megger	vibrating-reed frequency meter	**clamp-on ammeter**	D'Arsonval iron-vane probe
1451	What is a useful instrument for checking 3 phase A.C. motor performance by measuring possible unbalanced currents?	hand or battery-operated megger	vibrating-reed frequency meter	**clamp-on ammeter**	D'Arsonval iron-vane probe
1452	What is a wattmeter used to measure and indicate?	**the power being consumed by electrical equipment**	partial circuit resistance	current flowing in a circuit	voltage existing between two points in a circuit
1453	What is adjusted so that the kW load is evenly distributed between two alternators just placed in parallel?	a balance coil	**the engine governor speed settings**	the rotor field excitation	a interpole field rheostat
1454	What is adjusted so that the kW load is evenly distributed between two alternators operating in parallel?	the balance coil	**the governor speed control settings**	the field excitation	the manual voltage control rheostat
1455	What is an advantage of DC motors over AC motors?	DC motors are less expensive than AC motors	DC motors require less maintenance than AC motors	DC motors can be started across the line whereas AC motors cannot	**DC motors offer a more effective means of controlling speed than AC motors**
1456	What is an ammeter used to measure?	the voltage between two points in a circuit	circuit continuity	**current flow in a circuit**	total or partial circuit resistance
1457	What is an effective method of troubleshooting digital circuits in a console?	**supply alternate logic levels at the input(s) and test for change of state conditions at the output**	ground all inputs and test for a logic "1" at the output	open all inputs and test for a logic '0' at the output	vary each input smoothly from 0-10 volts and test for similar variance at the output
1458	What is an important factor in minimizing D.C. motor commutator wear?	keeping the ambient humidity as low as possible	ensuring a very low brush current density	**establishing the copper oxide surface film**	insuring that brush pressure is excessive
1459	What is an ohmmeter used to measure?	the amount of current flow in a circuit	voltage between two points in a circuit	**circuit resistance**	circuit power
1460	What is another name for the a.c-d.c thyristor controller as shown in figure "A" of the illustration?	armature rectifier	speed control rectifier	field rectifier	**inverter**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1461	What is being detected by checking the stator-to-rotor air gap clearance in an induction motor periodically with a feeler gage?	rotor contact with the laminations	changes in armature magnetic strength	**excessive bearing wear**	electrical damage to the rotor
1462	What is detected by checking the stator-to-rotor air gap clearance of an induction motor periodically with a feeler gage?	any decrease in motor magnetizing current	an increase in hysteresis loss	increase in apparent power factor	**any increase in rotor bearing wear**
1463	What is he most practical method of controlling the RPM of a multi-speed AC motor operating at a constant frequency?	change the input voltage	**change the number of operating poles**	change the power factor	change the number of brushes
1464	What is indicated by gradual blackening at the ends of component "4" shown in figures "B" and "C" of the illustration?	The unit is in danger of exploding.	**The tube is nearing the end of its useful life.**	The circuit voltage is too high.	The circuit current is too high.
1465	What is indicated if violent gassing occurs when a lead-acid storage battery is first placed on charge?	the battery must be given an emergency charge	the charging rate is too low	**the charging rate is too high**	the specific gravity of the electrolyte solution is too low
1466	What is meant by a 'dead front' switchboard?	a switchboard without switches on it	**a switchboard with insulated switches and no exposed terminals**	a switchboard without circuit breakers	a switchboard without safety hand rails nor rubber mats
1467	What is meant by the process of "local action" in a lead-acid storage battery?	hydrogen gas is liberated	the electrolyte compensates for overcharging	potassium hydroxide absorbs carbon dioxide from the air	**the battery becomes discharged without being connected to a load**
1468	What is meant by the synchronous speed of an AC induction motor?	speed at which the rotor turns	**speed of the rotating stator magnetic field**	frequency of the rotor current	slip in per cent of rotor RPM
1469	What is meant by the term 'dielectric'?	**electrical insulator**	current flow	good conductor	semiconductor material
1470	What is one factor that determines the frequency of an alternator?	number of turns of wire in the armature coil	**speed of the rotor**	strength of the magnets used	strength of the output voltage
1471	What is one function of the movable cams in a drum-type winch motor controller?	**regulate the speed of the motor**	maintain resistance contacts in clean condition	insulate the operating handle	limit the amount of load put on the motor
1472	What is one function of the movable contacts in a drum-type motor controller?	**regulate the voltage applied to the motor**	maintain resistance contacts in clean condition	insulate the operating handle	limit the amount of load put on the motor
1473	What is one major advantage of a diesel electric propulsion plant?	**excellent maneuverability**	low cost and weight	less maintenance	lower fuel consumption
1474	What is one purpose of a motor undervoltage protection device?	**prevent automatic restart when power source voltage is restored**	start the motor at a very low voltage	trip the load off the motor in case of fire	protect personnel from low voltage shocks

ID #	Question	Choice A	Choice B	Choice C	Choice D
1475	What is practice is considered conducting proper storage battery maintenance?	**keeping connections tight and casing surfaces clean**	making sure electrolyte level is below the separator plates	insulating the terminals with naval jelly	maintaining a high charging rate at all times
1476	What is prevented by one of the generator or motor bearings being generally insulated from the end housing with which it is associated?	rapid brush wear	current leakage from the shaft	excessive field winding heat	**circulation of shaft currents induced in the machine's frame**
1477	What is prevented when one of the generator bearing shells is generally insulated from its end housing?.	rapid brush wear	residual magnetism leak off	excessive field winding heat	**circulation of shaft currents**
1478	What is represented by the two parallel lines within components "3" and "5" of the circuit shown in figure "C" of the illustration?	A ground connection	**An iron core**	Ventilation openings	A mounting base
1479	What is statement is true concerning the total resistance of a parallel circuit?	The total resistance is larger than the greatest branch resistance.	**The total resistance is smaller than the lowest branch resistance.**	The total resistance is equal to the sum of the individual branch resistances.	The total resistance is equal to one-half the sum of the individual branch resistances.
1480	What is statement is true in reference to reading electrical motor controller elementary diagrams?	current paths in the control circuit are drawn as heavy lines and in the power circuit as lighter lines	**current paths in the power circuit are drawn as heavy lines and in control circuit as lighter lines**	circuits subject to 500 volts or greater are drawn as heavy lines and below 500 volts as lighter lines	circuits subject to 500 volts or greater are drawn as light lines and below 500 volts as heavy lines
1481	What is the ampere-hour rating of a lead-acid battery that can deliver 20 amperes continuously for 10 hours?	20	40	**200**	400
1482	What is the approximate discharge voltage produced by one cell of a wet type nickel-cadmium battery?	**1.2 volts**	1.5 volts	2.2 volts	6.0 volts
1483	What is the approximate discharge voltage produced by one wet cell of a nickel-cadmium battery?	**1.2 volts**	1.5 volts	2.2 volts	6.0 volts
1484	What is the approximate voltage per cell produced by the nickel-iron (Edison) battery?	0.85 volts	**1.37 volts**	2.20 volts	6.05 volts
1485	What is the basic "control action" of a magnetic amplifier dependent upon?	changes in capacitance	**changes in inductance**	changes in resistance	changes in conductance
1486	What is the basic operating principle of a transformer in terms of producing a voltage?	**mutual inductance**	self-inductance	eddy currents	hysteresis
1487	What is the basic principle of operation by which a transformer works?	self impedance	attraction and repulsion	**mutual induction**	increasing power

ID #	Question	Choice A	Choice B	Choice C	Choice D
1488	What is the basic similarity between a circuit breaker and a fuse?	after a short or overload condition, both must be reset to re-energize the circuit	**after a short or overload condition, both should open to de-energize the circuit**	after a short or overload condition, both have to be replaced before the circuit can be re-energized	A circuit breaker and a fuse have no similarities
1489	What is the basic unit of measure for inductance?	coulomb	ohm	farad	**henry**
1490	What is the best method of determining the state of charge of a lead acid storage battery?	testing of the individual cell voltages	ampere hour capacity of the battery	**specific gravity of the electrolyte**	total cell voltages
1491	What is the best method used to properly resurface an eccentric commutator on a small DC electric motor?	**turn it down in the ship's lathe**	use a fine tooth file	use a hand stone	burnish it with a commutator stone while running
1492	What is the characteristic of a wound-rotor induction motor, with a high resistance inserted in series with the rotor winding at startup?	relatively low starting torque and high stator current	**relatively high starting torque and low stator current**	relatively low starting torque and low stator current	relatively high starting torque and high stator current
1493	What is the characteristic of an wound rotor induction motor with maximum rheostat resistance inserted in the rotor circuit during starting?	relatively low starting torque and low stator current	**relatively high starting torque and low stator current**	relatively low starting torque and high starting current	relatively high starting torque and high stator current
1494	What is the characteristic of the hydrogen gas given off by lead-acid batteries when charging?	the gas is considered inert	**the gas is highly explosive**	the gas is extremely toxic	the gas is heavier than air
1495	What is the characteristic of the mica used in the commutators of DC machinery?	**it is harder than copper**	it is softer than copper	it is the same hardness as the copper	it is softer than copper but wears away at a slower rate
1496	What is the characteristic that is associated with an "instantaneous-trip" single-element type fuse?	**opens as soon as the load current exceeds its set point**	allows a preset delay between overcurrent and melting	opens a circuit by using a time delay element with a magnetic trip	resets itself when the overcurrent is corrected
1497	What is the combined effect of inductive reactance, capacitive reactance, and resistance in an alternating current circuit known as?	reactance	total reactance	**impedance**	resonance
1498	What is the correct name for a variable resistor wired in series with the shunt field for the purposes of manually controlling generator output voltage?	bleeder resistor	**rheostat**	bridge	variable shunt strip
1499	What is the correct name for current that flows in only one direction?	alternating current	omnidirectional current	**direct current**	sinusoidal current
1500	What is the correct name for the device used in an electrical circuit to change alternating current to direct current?	current transformer	**rectifier**	condenser	shunt
1501	What is the correct term for the fluctuation of voltages in figure "H" shown in the illustration?	wave	**ripple**	roll	swell

ID #	Question	Choice A	Choice B	Choice C	Choice D
1502	What is the current flow through R1 of the circuit in figure "B" of the illustration with the switch closed if the resistance of R1 is 2 ohms, R2 is 3 ohms and R3 is 6 ohms and the battery voltage is 12 VDC?	2 amps	4 amps	**6 amps**	12 amps
1503	What is the current flowing through R1 of figure "B" of the illustrated circuit with the switch closed and with a 6 VDC battery if the resistance of R1 is 2 ohms, R2 is 4 ohms and R3 is 4 ohms, respectively?	0.5 amps	1.5 amps	**3.0 amps**	6 amps
1504	What is the current flowing through R2 in figure "B" of the illustrated circuit with the switch closed if the battery voltage is 12 VDC and the resistance of R1 is 2 ohms, R2 is 3 ohms and R3 is 6 ohms?	2 amps	**4 amps**	6 amps	12 amps
1505	What is the current flowing through R3 in figure "B" of the illustrated circuit when the switch is closed if the battery voltage is 12 VDC and resistance of R1 is 2 ohms, R2 is 3 ohms, and R3 is 6 ohms, respectively?	**2 amps**	4 amps	6 amps	12 amps
1506	What is the current through R2 of figure "B" of the circuit illustrated with the switch closed if the resistance of R1 is 2 ohms, R2 is 4 ohms, and R3 is 4 ohms and the battery voltage is 6 VDC?	0.5 amp	**1.5 amps**	3.0 amps	6 amps
1507	What is the device shown in figure "B" of the illustration between the source circuit breaker and the load?	noise filtering choke	**auto-transformer**	fluorescent light ballast	power factor correction inductor
1508	What is the 'dielectric constant' of dry air or a vacuum?	**1**	10	100	1000
1509	What is the direction of electron current through the load resistor in the circuit shown in the illustration?	Always from point "TP5" to the grounded end.	**Always from the grounded end to point "TP5".**	It depends on the instantaneous polarity at"T1".	It cannot be determined without a directional ammeter.
1510	What is the drive arrangement of refrigeration compressor shown in figure "A" of the illustration?	welded, fully hermetic	**serviceable, bolted, accessible semi-hermetic**	external-drive	open
1511	What is the drive arrangement of refrigeration compressor shown in figure "B" of the illustration?	**welded, fully hermetic**	serviceable, bolted, accessible semi-hermetic	external-drive	open
1512	What is the drive arrangement of refrigeration compressor shown in figure "C" of the illustration?	welded, fully hermetic	serviceable, bolted, accessible semi-hermetic	**open, external-drive**	serviceable, bolted, accessible fully hermetic
1513	What is the formula for computing impedance in a series circuit containing resistance, capacitance, and inductance. [NOTE: the symbol * stands for 'multiplied by']	Z = RT + XL + XC	Z = R + XL - XC	**Z * Z = R * R + (XL - XC) * (XL - XC)**	Z = R * R + (XL * XC) - (XL * XC)

ID #	Question	Choice A	Choice B	Choice C	Choice D
1514	What is the function of a shading coil as used in an AC magnetic controller?	**reduce chatter and noise in the contactor**	prevent flux buildup in the operating coil	eliminate arcing when the contacts close	energize the operating coil and 'pull in' the contacts
1515	What is the function of amortisseur, or damper windings in a synchronous motor?	eliminate slippage	provide excitation	**provide starting torque**	increase efficiency
1516	What is the function of automatic voltage regulators as provided on switchboards?	regulate the AC load on the generator	protect the switchboard from high voltage	govern prime mover speed to control voltage	**vary the field excitation to the generators**
1517	What is the function of section "D" of the circuit shown in the illustration?	**a voltage regulator**	a filter	a rectifier	a voltage transformer
1518	What is the function of the autotransformers used with autotransformer starters used on some large AC motors?	provide increased voltage for starting	provide increased torque for starting	**provide reduced voltage for starting**	provide speed control
1519	What is the function of the circuit shown in the illustration?	pulse trigger circuit for an operational amplifier	three stage, high gain class "A" amplifier	**binary ripple counter or shift register**	free running multivibrator
1520	What is the function of the commutator associated with a DC motor?	**allow current flow in the armature windings under a given pole to be in the same direction at all times**	reverse the flow of current in the field poles	reduce the reluctance of the magnetic path through the motor	shift the neutral running plane of the brushes to prevent sparking
1521	What is the function of the electric brake on an deck cargo winch?	automatically engage when the winch motor current is reaching full load	**automatically hold the load if power to the winch motor is disconnected**	automatically govern the lowering speed of the load	automatically govern the hoisting speed of the load
1522	What is the function of the interpoles installed in DC motors?	To provide greater torque by strengthening the main field.	**To provide sparkless commutation without having to shift the brushes.**	To limit the production of counter-electromotive force.	To limit the starting surge current.
1523	What is the function of the squirrel cage windings installed on a synchronous motor rotor?	eliminate slippage	provide excitation	**provide starting torque**	increase efficiency
1524	What is the functional name of an electrical device which prevents simultaneous energization of loads thereby preventing damage or injury.	mechanical limit device	monitoring device	modulating device	**electrical interlock device**
1525	What is the functional name of section "B" of the circuit shown in the illustration?	voltage regulator	filter	**rectifier**	voltage transformer

ID #	Question	Choice A	Choice B	Choice C	Choice D
1526	What is the functional purpose component "5" as shown in figure "B" of the illustration?	regulate the current drawn by the fluorescent tube once the arc has been stricken	provide power factor correction	**initially heat the fluorescent tube filaments at startup and cause the ballast to shrike the arc to fire the tube after warm-up**	to rapidly strike the arc to fire the tube nearly instantly after the lighting fixture switch is closed
1527	What is the functional purpose of a heat sink, as frequently used with transistors?	**to prevent excessive temperature rise**	to compensate for excessive doping	to increase the reverse current	to decrease the forward current
1528	What is the functional purpose of an impressed current cathodic protection system aboard ship besides preventing corrosion of the hull?	**prevent corrosion of the propeller, rudder and line shafting**	neutralize the vessel's stray magnetic fields which would interfere with radar	protect engine room and deck machinery from oxidation in the presence of salt air	maintain a minimum constant alternator load to prevent overheating
1529	What is the functional purpose of component "3" of the circuit shown in figure "B" of the illustration?	provide power factor correction for the lighting fixture to compensate for the inductive effect of the ballast	**provide the surge in voltage to strike the arc within the fluorescent tube and regulate tube current**	provide radio interference suppression	provide the initial conditions for heating of the fluorescent tube filaments
1530	What is the functional purpose of the 'LSH' contacts for the hoist controller circuit shown in the illustration?	**it is a limit switch which automatically stops the winch drum rotation in the hoist direction before the hoist block is able to strike the boom**	it is a limit switch which automatically stops the winch drum rotation in the lower direction before all the cable is payed out insuring that a few wraps remain on the drum	it is a limit switch which illuminates a warning light to warn the winch operator when the hoist block is approaching the boom	it is a limit switch which illuminates a warning light to warn the winch operator when the cable has only a few wraps on the drum while paying out
1531	What is the functional purpose of the 'LSL' contacts for the hoist controller circuit shown in the illustration?	it is a limit switch which automatically stops the winch drum rotation in the hoist direction before the hoist block is able to strike the boom	**it is a limit switch which automatically stops the winch drum rotation in the lower direction before all the cable is payed out insuring that a few wraps remain on the drum**	it is a limit switch which illuminates a warning light to warn the winch operator when the hoist block is approaching the boom	it is a limit switch which illuminates a warning light to warn the winch operator when the cable has only a few wraps on the drum while paying out
1532	What is the functional purpose of the 'MS 2' contacts in the hoist controller circuit shown in the illustration?	the 'MS 2' contacts are used to select for 'second point' hoisting and lowering	the 'MS 2' contacts are used to select for 'first point' hoisting and lowering	**the 'MS 2' contacts are not used in this particular application**	the "MS 2' contacts are used for resetting the undervoltage (UV) contactor

ID #	Question	Choice A	Choice B	Choice C	Choice D
1533	What is the functional purpose of the resistor 'RL" placed in parallel to the output of a DC power supply as shown in section "D" of the regulated DC power supply?	is a temperature compensator	corrects power factor	prevents excessive currents	**aids in output voltage regulation**
1534	What is the greatest single cause of electrical failures?	**the breakdown of insulation**	overcurrent	high inductance	too frequent testing
1535	What is the illustrated circuit used to measure?	**resistance**	gauss or magnetic field strength	battery discharge rate in Amp-hours	capacitance
1536	What is the indication on the switchboard of a ground on a particular phase of an ungrounded three-phase low voltage distribution system?	higher switchboard wattmeter reading than normal	lower switchboard wattmeter reading than normal	**dark or dim switchboard ground detecting light**	higher voltmeter reading than normal
1537	What is the instrument called a galvanometer used to measure?	thickness of galvanized metal	resistance of electrical wiring insulation	**very small amounts of current**	quantity of galvans in an electric circuit
1538	What is the item referred to as a pigtail on a DC motor brush rigging?	feather spring	**uninsulated wire**	flexible spring adjuster	brush holder
1539	What is the main difference between a motor control circuit featuring low voltage protection and a motor control circuit featuring low voltage release?	low voltage release features normally open line contacts, low voltage protection features normally closed line contacts	low voltage release features thermal-overload protection, low voltage protection does not	**low voltage release features a maintained contact start switch, low voltage protection features a momentary contact start switch**	low voltage release features a momentary contact start switch, low voltage protection features a maintained contact start switch
1540	What is the main difference between a vacuum tube and a semiconductor device?	**A vacuum tube requires a heated cathode to emit electrons, a semiconductor device does not.**	A semiconductor device requires a heated cathode to emit electrons, a vacuum tube does not.	Both vacuum tubes and semiconductor devices require a heated cathode to emit electrons.	Neither vacuum tubes nor semiconductor devices require a heated cathode to emit electrons.
1541	What is the main function in the use of a capacitor for starting a single phase motor?	Reduce radio interference	**Split the phase to create greater starting torque**	Reduce the phase angle	Prolong the life of the starting contacts
1542	What is the main purpose of an electric space heater installed in a large AC generator?	prevent the windings from becoming brittle	**prevent moisture from condensing in the windings during shutdown**	prevent acidic pitting of the slip rings	keep the lube oil warm for quick starting
1543	What is the main purpose of the auxiliary winding on a split-phase, single-phase motor?	limit the starting voltage	increase the starting current	**provide starting torque**	keep the motor running in the event the main winding should fail
1544	What is the major advantage of a diesel electric propulsion plant over other drive systems?	low cost and weight	**excellent propulsion maneuverability**	less maintenance	lower fuel consumption

ID #	Question	Choice A	Choice B	Choice C	Choice D
1545	What is the maximum allowable primary current of a 2 kVA step-down transformer with a four to one turns ratio if the primary is connected across a 440 volt line?	1.1 amps	**4.5 amps**	18.1 amps	27.7 amps
1546	What is the maximum current allowed to be drawn from the secondary of a 2 kVA step-down transformer with a turns ratio of four to one if connected across a 440 volt line?	1.1 amps	4.5 amps	**18.1 amps**	22.7 amps
1547	What is the most common source of excitation for the rotor of a synchronous motor?	a step-up transformer	a half-wave rectifier	**a DC power supply**	an AC power supply
1548	What is the most common type of AC service generator found aboard ship in terms of armature and field types?	stationary electromagnetic field, rotating armature type	stationary electromagnetic field, oscillatory armature type	stationary armature, oscillatory electromagnet field type	**stationary armature, rotating electromagnetic field type**
1549	What is the most effective method of locating a loose commutator bar in a D.C. motor?	visual inspection	jiggling each by hand	**sounding each bar with a light weight hammer**	checking with a calibrated torque wrench
1550	What is the most practical method used for resurfacing a ship's main propulsion motor commutator?	turn it down in the ship's lathe	**use a grinding rig**	use a hand stone	burnish it with commutator stones
1551	What is the most practical method used for resurfacing a ship's main propulsion motor commutator?	turn it down in the ship's lathe	**use a portable grinding and metal cutting rig attached to the motor frame**	use a hand stone	burnish it with commutator stones
1552	What is the most practical way to control the voltage output of an AC generator?	varying the number of windings	varying the speed of the rotating field	**varying the strength of the rotating magnetic field**	varying the power factor of the load
1553	What is the most reliable indication of the state of charge of a lead-acid battery?	individual cell voltage	ampere-hour capacity	**electrolyte specific gravity**	total cell voltage
1554	What is the name for the device shown in figure "A" of the illustration?	full wave bridge rectifier	**half wave rectifier**	full wave rectifier	direct current (DC) filter
1555	What is the name for the device shown in figure "B" of the illustration?	full wave bridge rectifier	half wave rectifier	**full wave rectifier**	direct current (DC) filter
1556	What is the name for the device shown in figure "C" of the illustration?	**full wave bridge rectifier**	half wave rectifier	full wave rectifier	direct current (DC) filter
1557	What is the name of the component labeled CR1 as shown in section "D" of the regulated DC power supply illustrated?	rectifier diode	**zener diode**	tunnel diode	diac
1558	What is the name of the component labeled Q1 as shown in section "D" of the regulated DC power supply illustrated?	**NPN bipolar junction transistor**	PNP bipolar junction transistor	triac	silicon-controlled rectifier
1559	What is the name of the DC motor speed control method utilized as shown in figure "B" of the illustration?	**Ward-Leonard**	Sperry-Rand	Atlas-Copco	Burmeister-Wain

ID #	Question	Choice A	Choice B	Choice C	Choice D
1560	What is the name of the device shown in figure "1" of the illustration?	light-emitting diode	rectifier bridge	silicon-controlled rectifier	**rectifier diode**
1561	What is the name of the device shown in figure "2" of the illustration?	silicon-controlled rectifier	light-emitting diode	**power rectifier diode**	rectifier bridge
1562	What is the name of the device shown in figure "3" of the illustration?	rectifier diode	power rectifier diode	**rectifier bridge**	silicon-controlled rectifier
1563	What is the name of the device shown in figure "4" of the illustration?	rectifier diode	power rectifier diode	rectifier bridge	**silicon-controlled rectifier**
1564	What is the name of the device shown in figure "5" of the illustration?	rectifier bridge	**integrated circuit**	bipolar junction transistor	silicon-controlled rectifier
1565	What is the name of the device shown in figure "7" of the illustration?	rectifier diode	**light-emitting diode**	bipolar junction transistor	power rectifier diode
1566	What is the name of the device which prints out a permanent record of the plant operating parameters and conditions?	analogger	bell logger	alarm logger	**data logger**
1567	What is the name of the digital logic gate represented by figure "1" of the illustration?	AND gate	**OR gate**	NAND gate	NOR gate
1568	What is the name of the digital logic gate represented by figure "1" of the illustration?	AND gate	**OR gate**	Exclusive OR gate	NOR gate
1569	What is the name of the digital logic gate represented by figure "2" of the illustration?	AND gate	OR gate	Exclusive OR gate	**NOR gate**
1570	What is the name of the digital logic gate represented by figure "3" of the illustration?	**AND gate**	OR gate	Exclusive OR gate	NOR gate
1571	What is the name of the digital logic gate represented by figure "5" of the illustration?	OR gate	AND gate	**Exclusive OR gate**	Exclusive NOR gate
1572	What is the name of the digital logic gate represented by figure "6" of the illustration?	Inverter	NAND gate	Exclusive OR gate	**Exclusive NOR gate**
1573	What is the name of the digital logic gate represented by figure "7" of the illustration?	**Inverter**	NAND gate	Exclusive OR gate	Exclusive NOR gate
1574	What is the name of the force that causes free electrons to flow in a conductor producing electric current?	resistant force	**electromotive force**	inductive force	dielectric force
1575	What is the name of the four devices which make up the circuit shown in the illustration?	**flip-flops**	exclusive 'OR' gates	summing op amps	function generators
1576	What is the name of the mechanism used to transmit rudder angle information from the steering gear itself to the wheelhouse in the illustrated rudder angle indicator system?	telemotor	**synchronous transmission**	differential gear	gear transmission
1577	What is the name of the part of the shipboard electrical system used to control the distribution of power to the branch circuits?	bridge control panel	disconnect links	governor relay box	**main switchboard**
1578	What is the name of the process used to produce electron emission in most vacuum tubes?	photoelectric emission	secondary electric emission	cold cathodic electric emission	**thermionic emission**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1579	What is the name of the semiconductor that decreases in resistance with an increase in temperature?	resistor	**thermistor**	diode	thermopile
1580	What is the name of the type of motor control circuit that will not permit automatic restarting after power is restored, following a power failure?	**low voltage protection**	low voltage release	overload lockout	reduced voltage restart
1581	What is the operating function of a cycloconverter (CCV) as a static power converter used in electric propulsion motor drives?	**provides adjustable frequency to power an ac propulsion drive motor**	converts ac power to dc power in a dc propulsion drive system	converts dc power to ac power in an ac propulsion motor	provides constant frequency output power to an ac propulsion drive motor
1582	What is the opposition to alternating current flow through a coil due to inductance called?	impedance factor	capacitive reactance	**inductive reactance**	reactive inductance
1583	What is the opposition to the establishment of magnetic lines of force in a magnetic circuit called?	resistance	**reluctance**	impedance	inductance
1584	What is the phase relationship between voltage and current in an alternating current circuit including both inductive and resistive loads?	Current and voltage will be in phase.	Current will lead the voltage.	**Current will lag the voltage.**	Any of the above could be true.
1585	What is the polarity of voltage at test point 5 (TP5) with respect to ground referring to the circuit shown in the illustration?	**It will always be positive.**	It will always be negative.	It depends on the instantaneous polarity at T1.	It cannot be determined without a voltmeter.
1586	What is the power consumed by 'R1' in the circuit illustrated in figure "B" with the switch closed if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	2 watts	3 watts	6 watts	**12 watts**
1587	What is the power consumed by 'R2' in the circuit illustrated in figure "B", if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	**16 watts**	20 watts	24 watts	28 watts
1588	What is the power consumed by 'R3' in the circuit illustrated in figure "B" with the switch closed if the applied voltage is 24 volts and resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	12 watts	**20 watts**	24 watts	48 watts
1589	What is the primary function of an electric motor?	**develop torque**	generate high voltages	produce a magnetic field	generate high electrical resistance
1590	What is the primary functional purpose of the KM1 contactor as shown in the illustration?	**connects the autotransformer in "wye" configuration while in the start mode**	connects the motor to the autotransformer while in the start mode	connects the motor across line while in the start mode	connects the motor across line wile in the run mode

ID #	Question	Choice A	Choice B	Choice C	Choice D
1591	What is the primary functional purpose of the KM2 contactor as shown in the illustration?	connects the autotransformer in "wye" configuration while in the start mode	**connects the motor to the autotransformer while in the start mode**	connects the motor across line while in the start mode	connects the motor across line wile in the run mode
1592	What is the primary functional purpose of the KM3 contactor as shown in the illustration?	connects the autotransformer in "wye" configuration while in the start mode	connects the motor to the autotransformer while in the start mode	connects the motor across line while in the start mode	**connects the motor across line wile in the run mode**
1593	What is the primary means by which the motor branch circuit is protected from a short-circuited motor?	The thermal overload relay (OL)	The secondary side control circuit fuses (FU6 and FU7)	The primary side control circuit fuses (FU4 and FU5)	**The fused disconnect switch (Q1) fuses (FU1, FU2, and FU3)**
1594	What is the primary means by which the motor branch circuit is protected from an overloaded motor?	**The thermal overload relay (OL)**	The secondary side control circuit fuses (FU6 and FU7)	The primary side control circuit fuses (FU4 and FU5)	The fused disconnect switch (Q1) fuses (FU1, FU2, and FU3)
1595	What is the primary purpose associated with the use of transformers onboard ships with AC generators?	change line frequency value	increase power output to modulating frequency controllers	decrease power output to modulating frequency controllers	**provide different voltage values to operate various types of electrical equipment.**
1596	What is the primary purpose of the brushes of DC generators?	neutralize armature reaction	**conduct armature current to an external load**	convert DC current to AC current	provide excitation to a DC generator
1597	What is the probable cause of a loud buzzing noise in an AC controller?	poor contact with the overload relay	an incorrectly sized heater	**a broken shading coil**	counter EMF
1598	What is the proper name for the entire device, including all subassemblies, shown in the illustration?	Safety disconnect switch	Magnetic starter	**Combination starter**	Magnetic contactor
1599	What is the proper technique for removing a tubular fuse from a fuse holder?	use of an insulated screwdriver	use of a pair of insulated metal pliers	use of any insulated object	**use of insulated fuse pullers**
1600	What is the proper way to apply plastic electrical tape to an electric cable splice?	apply tape to the braided cover, but avoid touching it	**wind the tape so that each turn overlaps the turn before it**	apply the tape in one non-overlapping layer only	heat the tape with a soldering iron for good bonding
1601	What is the proper way to mix the electrolyte for a lead-acid battery?	pour the acid into the alkaline water	**pour the acid into the distilled water**	pour the alkaline water into the acid	pour the distilled water into the acid
1602	What is the purpose for the device shown in figure "B" of the illustration in terms of its relationship with the load?	**it functions to step down voltage**	it functions to step up voltage	it functions as a ground isolator	it functions as a filter

ID #	Question	Choice A	Choice B	Choice C	Choice D
1603	What is the purpose of a potential transformer in an electric circuit?	generate its own electrical power	transform electrical energy into mechanical energy	**increase or decrease circuit voltage as required**	convert AC current to DC current
1604	What is the purpose of a ship's service generator circuit breaker's reverse-power trip?	prevent main circuit overload	protect the circuit breaker blowout coil	**prevent alternator motorization**	prevent low voltage trip out
1605	What is the purpose of a squirrel cage rotor winding placed on the rotor of a synchronous motor?	provide excitation to the DC field	**start the machine as an induction motor**	contribute extra torque at synchronous speed	prevent the machine from falling out of step
1606	What is the purpose of amortisseur windings in a synchronous motor?	reduce eddy current losses	produce a higher power factor	**provide a means for starting**	eliminate arcing between the stator and the rotor
1607	What is the purpose of an electro-magnetic relay?	open a circuit only in the event of overload	**remotely open and close contacts by action of a coil**	provide overcurrent protection during starting	relay voltages at increased power
1608	What is the purpose of having low voltage protection for an electric motor circuit?	prevent severe arcing or sparking under low voltage conditions	protect against reversal of power in the main circuit under low voltage conditions	**prevent excessive current from developing as it is attempting to deliver its required horsepower under low voltage conditions**	prevent the motor from overspeeding under low voltage conditions
1609	What is the purpose of installing shading coils on AC full-voltage starters?	**eliminate contact chatter**	dissipate opening contact arcs	delay current build up in the holding coil	protect the motor windings from momentary starting current overload
1610	What is the purpose of the capacitor within component "5" of the circuit shown in figure "B" of the illustration?	**prolong the life of the component's contacts**	discharge the neon within the envelope	counteract the inductive reactance in the circuit	store power to operate the circuit should "D" open
1611	What is the purpose of the commutator and brushes on a DC generator?	transfer generated direct current voltage from the armature to the line	**convert the alternating current voltage generated within the armature to a direct current voltage**	provide a sliding contact method to excite the field	reduce sparking between the armature and the carbon brushes
1612	What is the purpose of the commutator and brushes on a DC generator?	transfer generated direct current voltage from the armature to the line	**convert the alternating current voltage generated within the armature to a direct current voltage to the line**	provide a sliding contact method to excite the field	reduce sparking between the armature and the carbon brushes

ID #	Question	Choice A	Choice B	Choice C	Choice D
1613	What is the purpose of the device labeled 'Man-Auto Sw.' in the illustrated switchboard?	**shift from the automatic voltage regulator to manual voltage control or vice versa**	shift the governor control from manual to automatic/zero droop or vice versa	enable the operator to read the field voltage on device 'Volt.Reg.Adj.Pot.' or device 'Man.Volt.Adj.Rheo'	supply regulated control power to the switchboard
1614	What is the purpose of the devices labeled "F SW" on the illustrated switchboard drawing?	to determine the individual frequencies of each leg of a three phase alternator output to be displayed on the frequency meter by selective switching	to determine the difference between the individual frequencies of each leg of the three phase alternator output to be displayed on the frequency meter by selective switching	**to select which alternator frequency is to be displayed on the frequency meter**	to determine the average frequency of individual frequencies of each leg of a three phase alternator output to be displayed on the frequency meter
1615	What is the purpose of the electronic regulator as shown in the illustration?	It receives an input from the control amplifier as well as the setpoint potentiometer and the output controls the reference anode current.	It receives an input from the control amplifier as well as the reference anode and the output controls the setpoint value.	**It receives an input from the setpoint value potentiometer as well as the reference anode and the output controls the protective anode current via the control amplifier.**	It receives an input from the setpoint potentiometer and the output controls both the reference anode current and the protective anode current.
1616	What is the purpose of the inner phosphor coating of the fluorescent tube as shown in figure "A" of the illustration?	absorb visible ultraviolet light and emit visible white light	absorb visible ultraviolet light and emit invisible white light	**absorb invisible ultraviolet light and emit visible white light**	absorb invisible ultraviolet light and emit invisible white light
1617	What is the purpose of the squirrel-cage windings included as part of a synchronous motor?	provide more precise balancing	produce a higher power factor	eliminate arcing between the stator and the frame	**provide a means for starting**
1618	What is the purpose of the synchronous compensator as shown in the illustration?	**to automatically provide leading kVAr to exactly match the ship's lagging kVAr load so as to provide overall unity power factor**	to automatically provide lagging kVAr to exactly match the ship's leading kVAr load so as to provide overall unity power factor	to automatically provide lagging kVAr to exactly match the ship's lagging kVAr load so as to provide overall unity	to automatically provide leading kVAr to exactly match the ship's leading kVAr load so as to provide overall unity

ID #	Question	Choice A	Choice B	Choice C	Choice D
1619	What is the reason that some electric cables are formed of stranded wire?	stranded wire increases the current carrying capability for a given size wire	**stranded wire increases their flexibility over solid wire and reduces skin effect losses**	stranded wire decreases the weight for a given size wire	stranded wire assures good conductivity at junction points
1620	What is the recommended method used to resurface an eccentric DC motor commutator?	**turn it down in the ship's lathe**	use a hard canvas wipe	use a hand stone	burnish it with commutator stones
1621	What is the resistance reading at "1" on the megger scale illustrated in figure "A"?	150 ohms	150 thousand ohms	120 megohms	**150 megohms**
1622	What is the resistance reading at "2" on the megger scale shown in figure "A" of the illustration?	40 ohms	400 ohms	40,000 ohms	**40 megohms**
1623	What is the resistance reading at "3" on the megger scale shown in figure "A" of the illustration?	12. 5 ohms	125 ohms	**12.5 megohms**	125 megohms
1624	What is the resistance reading at "5" on the megger scale shown in figure "A" of the illustration?	.35 megohms	**3.5 megohms**	35 megohms	350 megohms
1625	What is the resistance reading at "6" on the megger scale shown in figure "A" of the illustration?	**1.25 megohms**	12.5 megohms	125 megohms	125 thousand ohms
1626	What is the resistance reading at "7" on the megger scale shown in figure "A" of the illustration?	**500 thousand ohms**	5 megohms	50 megohms	500 megohms
1627	What is the resistance reading at "8" on the megger scale shown in figure "A" of the illustration?	250 ohms	**250 thousand ohms**	2.5 megohms	250 megohms
1628	What is the resistance reading at "9" on the megger scale shown in figure "A" of the illustration?	75 ohms	750 ohms	**75 thousand ohms**	75 megohms
1629	What is the rotor speed of a four pole, 60 cycle, induction motor operating at full load with 3% slip?	270 RPM	540 RPM	873 RPM	**1746 RPM**
1630	What is the rotor speed of a six pole, 60 cycle, induction motor operating at full load with 3% slip?	3492 RPM	1800 RPM	**1164 RPM**	1746 RPM
1631	What is the shape of the schematic symbol for an operational amplifier used in an analog circuit?	circle	square	trapezoid	**triangle**
1632	What is the significance of having an indicated power factor of 0.8 when describing the output of a generator?	The generator output voltage and current can be described as 20% resistive.	80% of the energy input to the generator produces useful output.	**80% of the output will be converted to useful power.**	This information characterizes the DC output of the generator.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1633	What is the specific name for the torque produced by a motor at the instant of startup when voltage is applied to the motor?	**locked-rotor torque**	pullout torque	breakdown torque	torque margin
1634	What is the standard procedure for maintaining the charge in an emergency diesel starting battery by trickle charge?	**continuously**	at least once each week	whenever the charge falls to 75% of full charge	whenever the electrolyte specific gravity falls to 1.250 or lower
1635	What is the starting characteristic associated with across-the-line starters as used with AC motors?	reduced starting current	regulated starting current	**high starting torque**	controlled starting acceleration
1636	What is the third color band on a resistor used to indicate?	tolerance of the resistor	**number of zeros following the first two significant figures in the resistance value**	first significant figure of the resistance	second significant figure of the resistance
1637	What is the total current in figure "B" of the illustrated circuit powered by a 6 volt battery if the resistance of R1 is 2 ohms, R2 is 4 ohms, and R3 is 4 ohms, respectively with the switch closed?	0.6 amp	1 amp	4 amps	**6 amps**
1638	What is the total current of the illustrated circuit in figure "B" with the switch closed if the battery voltage is 12 VDC and the resistance of R1 is 2 ohms, R2 is 3 ohms and R3 is 6 ohms, respectively ?	2 amps	4 amps	6 amps	**12 amps**
1639	What is the total resistance of figure "B" of the illustrated circuit if the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms?	0.5 ohms	1.28 ohms	1.5 ohms	**12 ohms**
1640	What is the total resistance of the electrical circuit illustrated in figure "B" if the resistance of R1 is 2 ohms, R2 is 4 ohms, and R3 is 4 ohms and the battery voltage is 6 volts?	0.01 ohms	0.10 ohms	**1.00 ohms**	10.00 ohms
1641	What is the twisting force developed by a motor and applied to a shaft called?	magnetism	electromotive force	**torque**	voltage
1642	What is the unit of measure for electrical power?	ampere	kilovolt	**watt**	farad
1643	What is the unit of measure for electrical resistance?	ampere	volt	watt	**ohm**
1644	What is the voltage across 'R1' of figure "B" of the illustrated circuit with the switch closed if the applied voltage is 24 volts and resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	2 volts	**6 volts**	8 volts	10 volts

ID #	Question	Choice A	Choice B	Choice C	Choice D
1645	What is the voltage across 'R2' of figure "B" of the illustrated circuit when the switch is closed if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	2 volts	6 volts	**8 volts**	10 volts
1646	What is the voltage across 'R3' in figure "B" of the illustrated circuit when the switch is closed if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	2 volts	6 volts	8 volts	**10 volts**
1647	What is the voltage potential between the neutral bus and the negative bus in a three-wire, 230/115 volt DC system?	0 volts	**115 volts**	230 volts	345 volts
1648	What is the wattage of a heating element drawing a current of 30 amperes, at 120 volts?	30 watts	99.97 watts	360 watts	**3600 watts**
1649	What is true concerning all of the connecting conductors of a DC series circuit?	they all have the same power expended in them	they all have the same voltage drop across them	they all have the same resistance to current flow	**they all have the same current passing through them**
1650	What is true concerning the installation of batteries used for diesel engine starting?	be located in a locker on the weather deck	**be located as close as possible to the engine**	have sufficient capacity to provide at least 50 starts consecutively without recharging	only be of the nickel alkaline type
1651	What is true concerning the specific gravity of the electrolyte solution in a lead acid battery?	the specific gravity is not affected during charging	the specific gravity remains the same during discharge	the specific gravity increases during discharge	**the specific gravity increases during charging**
1652	What item (or items) constitute routine AC motor controller maintenance?	blowing out with high pressure compressed air	**performing a visual inspection and tightening connections**	cleaning with carbon tetrachloride	cleaning with soap and water
1653	What material are the plates of a wet cell NiCad storage battery made of?	potassium hydroxide with a small amount of sulfuric acid	lead and lead peroxide	silver oxide and lead sulfate	**nickel hydroxide and cadmium oxide**
1654	What may be the cause of an AC generator to fail to produce a voltage?	**an open in the rotor field circuit**	a tripped bus circuit breaker	high mica segments on the stator bus bar	short circuit in the stator coils
1655	What may cause brush sparking in a DC generator during commutation?	eddy currents in the armature core	hysteresis in the armature core	excessive brush pressure	**misalignment of the brush rigging**
1656	What may cause magnetic controller contacts to become welded together during operation?	an open coil	**low contact pressure**	excessive ambient temperature	excessive magnetic gap
1657	What may cause magnetic controller contacts to become welded together during operation?	excessive magnetic gap	**low contact pressure**	an open coil	excessive ambient temperature

ID #	Question	Choice A	Choice B	Choice C	Choice D
1658	What must be done to adjust the kilowatt load division manually between two AC generators operating in parallel?	**adjusting the prime mover governor speed controls in opposite directions**	adjusting the generator output voltage in opposite directions	increasing both prime mover speeds simultaneously	decreasing both prime mover speeds simultaneously
1659	What must be done to manually equalize the power factor of two alternators operating in parallel?	**voltage settings of both units are adjusted in opposite directions**	governor speed settings of both units are adjusted in opposite directions	voltage settings of both units are adjusted in the same direction	governor speed settings of both units are adjusted in the same direction
1660	What operational characteristic does an across-the-line starter provide?	**maximum torque at startup**	reduced starting power	higher rated speed	reduced voltage at startup
1661	What operational characteristic is associated with the illustrated manual starter circuit for a motor shown in figure "A"?	incorporates low voltage protection because the motor will stop when voltage falls below a certain value and automatically start when normal voltage resumes	**has no low voltage protection and the motor may be damaged if the voltage drops below a certain level**	incorporates low voltage protection because the motor will stop when voltage falls below a certain value but must be manually restarted when normal voltage resumes	incorporates low voltage release because the motor will stop when voltage falls below a certain value and automatically start when normal voltage resumes
1662	What operational information data appears on the name plates of shipboard AC motors?	type of overload protection	rated slip	**temperature rise**	locked rotor torque
1663	What part of an operational amplifier functions to provide basic operating characteristics of the operational amplifier such as gain and stability?	the differential input amplifier stage	the power output amplifier stage	**the operational amplifier feedback circuit**	the intermediate voltage amplifier stage
1664	What power is consumed by a heating element drawing a current of 20 amperes at 120 volts?	20 watts	66.67 watts	720 watts	**2400 watts**
1665	What power would be consumed by the series resistor in the circuit shown in the illustration if the source is 30 volts, the resistance for R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms?	10 watts	30 watts	**40 watts**	60 watts
1666	What practice could potentially damage a multimeter?	**placing the test leads across a voltage source to measure voltage while in the resistance mode**	placing the test leads in series with the load of a circuit to measure current while in the voltmeter mode	placing the test leads across a de-energized and isolated resistance to measure resistance while in the ammeter mode	placing the test leads across a de-energized and isolated resistance to measure resistance while in the voltmeter mode
1667	What practice would be considered proper storage battery maintenance?	maintaining a high charging rate at all times	replacing the electrolyte once a year	insuring electrolyte level is below the separator plates	**applying petroleum jelly on connections to minimize corrosion**
1668	What property does capacitance have in an AC circuit?	stop current flow once the capacitor is fully charged	allow current flow in only one direction	**oppose any change in circuit voltage**	rectify the current

ID #	Question	Choice A	Choice B	Choice C	Choice D
1669	What should be used in the cleaning of a D.C. propulsion motor's commutator face?	**a canvas wiper**	emery cloth	abrasive dressing stones	sandpaper
1670	What should be done regarding the windings of electric generators during idle periods?	allowed to cool slowly to ambient temperatures	flashed with direct current to remove any residual magnetism	**kept warm by using strip or space heaters**	relieved of all capacitive charge by grounding the conductors
1671	What should be done to the charging current when a lead-acid battery begins gassing freely while receiving a normal charge?	it should be increased	it should remain unchanged	**it should be decreased**	it should be shut off
1672	What should be done when correcting specific gravity readings of a lead-acid battery for existing temperature conditions?	add 10 correction points for each 4°F the battery temperature is above 80°F	subtract 10 correction points for each 4°F the battery temperature is above 80°F	**add 4 correction points for each 10°F the battery temperature is above 80°F**	subtract 4 correction points for each 10°F the battery temperature is above 80°F
1673	What should be done when performing maintenance of circuit breaker contacts?	smooth roughened contact surfaces with a file	use a metallic oxide abrasive cloth to dress contacts	**inspect for wear and misalignment of main contacts**	apply a thin film of oil on contact surfaces
1674	What should be done with a capacitor discolored due to excessive heat?	calibrated	**replaced**	cooled	soldered
1675	What should be done with a capacitor that is obviously discolored due to excessive heat?	calibrated using a capacitance Wheatstone bridge	**replaced and the reason for the overheating found**	cooled with a spray can of refrigerant approved for this purpose	resoldered with care taken to insure that the original cold solder joint is repaired
1676	What should be done with the charging current when a lead-acid battery starts to gas freely after receiving a normal charge current?	it should be slightly increased	it should be shut off	**it should be decreased to a trickle charge current**	it should be maintained for an additional hour
1677	What should be in included in performing routine maintenance of dry-type transformers?	periodic flushing with water-based solvents	blowing out with high pressure compressed air	**periodic testing of insulation resistance with a megger**	ultrasonic cleaning
1678	What should be included in performing proper maintenance of a D.C. motor's commutator?	**side-cutting the copper segments and undercutting the mica**	coating the copper surface with light machine oil for the first four hours of operation	applying a thin coat of electrical varnish monthly	removing the chocolate brown oxide film from the commutator face
1679	What should be included in performing proper maintenance of a D.C. motor's commutator?	**side-cutting the copper segments and undercutting the mica**	coating the copper surface with light machine oil for the first four hours of operation	baking the armature in an oven at 350°C for 8 hours annually	painting the face of the commutator with insulating varnish

ID #	Question	Choice A	Choice B	Choice C	Choice D
1680	What should be included in the performance of routine maintenance of dry-type transformers?	**cleaning the windings, if accessible, with a vacuum cleaner or very low pressure air**	measuring and recording the winding temperature with an accurate mercury thermometer	periodic cleaning of the winding insulation with an approved solvent	making sure that the units are close to bulkheads or corners to protect them from damage
1681	What should be included in the routine periodic maintenance checks for electrical motors?	**checking for vibration**	checking for watertight integrity	checking for speed droop	checking for reactive power
1682	What should be included when performing maintenance of alkaline batteries?	checking the electrolyte weekly using a hydrometer	replacing the electrolyte every 5 years	top off with sulfuric acid as needed	**making certain connections are tight and clean**
1683	What should be kept in mind when you check the specific gravity of the battery electrolyte with a hydrometer?	the battery is fully charged when the indicator floats low in the electrolyte	any water that has been previously added to the cells will dilute the solution and give a false reading	**a hydrometer reading is inaccurate if taken immediately after water is added to the cell**	temperature has no effect on hydrometer readings
1684	What should be performed as routine maintenance of lead acid batteries?	**keeping the terminals and connections clean and tight**	replacing the electrolyte	replacing the plates and separators	conducting a load test
1685	What should be the frequency of the incoming machine when paralleling two AC generators immediately prior to closing its breaker?	at least 5 Hz higher than the bus frequency	exactly equal to the bus frequency	**slightly greater than the bus frequency**	slightly less than the bus frequency
1686	What should be the primary consideration when choosing a battery for a particular application?	**amp-hour capacity**	terminal polarity	stability under charge	ambient temperature rise
1687	What should you be aware of when checking the specific gravity of the battery electrolyte with a hydrometer?	the battery is fully charged when the float sinks deepest into the electrolyte	the battery is discharged when the float is highest in the electrolyte	a hydrometer reading is accurate if taken immediately after water is added to the cell	**depending on the temperature it may be necessary to correct for temperature**
1688	What statement is true concerning a ground in an 450 VAC electrical circuit outside the engine room?	It cannot be detected under normal conditions.	It is of no consequence to engineering personnel.	It is indicated at the branch circuit breaker panel.	**It is indicated by the ground detecting lamps on the main switchboard.**
1689	What statement is true concerning figure "A" of the illustrated hydronic heating/cooling systems?	During the cooling season, in the direction of flow, each terminal unit receives progressively cooler water supplied to its inlet.	**During the cooling season, in the direction of flow, each terminal unit receives progressively warmer water supplied to its inlet.**	During the heating season, in the direction of flow, each terminal unit receives progressively warmer water supplied to its inlet.	Regardless of the season, in the direction of flow, each terminal unit receives the same temperature water supplied to its inlet.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1690	What statement is true concerning figure "B" of the illustrated hydronic heating/cooling systems?	During the cooling season, in the direction of flow, each terminal unit receives progressively cooler water supplied to its inlet.	During the cooling season, in the direction of flow, each terminal unit receives progressively warmer water supplied to its inlet.	During the heating season, in the direction of flow, each terminal unit receives progressively warmer water supplied to its inlet.	**Regardless of the season, in the direction of flow, each terminal unit receives the same temperature water supplied to its inlet.**
1691	What statement is true concerning figure "C" of the illustrated hydronic heating/cooling systems?	**The chilled water circulating system and the hot water circulating systems may be placed into operation simultaneously.**	During the cooling season, in the direction of flow, each terminal unit receives progressively warmer water supplied to its inlet.	During the heating season, in the direction of flow, each terminal unit receives progressively cooler water supplied to its inlet.	The chilled water circulating system and the hot water circulating systems may NOT be placed into operation simultaneously.
1692	What statement is true concerning SCR power converters as used on diesel-electric propulsion drive systems?	**The propulsion generator is an AC machine, whereas the propulsion motor is a DC machine.**	The propulsion generator is a DC machine, whereas the propulsion motor is an AC machine.	The propulsion generator and propulsion motor are both AC .	The propulsion generator and propulsion motor are both DC machines.
1693	What statement is true concerning the actual mixing process and the container used when mixing electrolyte for a lead-acid storage battery?	pour the distilled water into the acid in a zinc-plated container	pour the distilled water into the acid in a glass container	pour the acid into the distilled water in a zinc-plated container	**pour the acid into distilled water in a glass container**
1694	What statement is TRUE concerning the Azipod propulsion system?	It is an electric drive system using water jets.	It is an electric drive system that incorporates a DC motor.	**It is an electric drive system where the propulsion motor is installed in a submerged housing capable of swiveling.**	It is an electric drive system in which the motor drives a controllable pitch propeller (CPP).
1695	What statement is true concerning the charging a 100 amp-hour lead-acid battery?	The temperature of the electrolyte should not be allowed to exceed 90°F.	**The initial charging rate should be no greater than 100% of the battery amp-hour rating.**	The source of power for charging should be 2.0 volts per cell.	The charging rate should be 100 amps for one hour.
1696	What statement is true concerning the electrical diagram shown in figure "B" of the illustration?	'R1', 'R2', and 'R3' are connected is series.	**'R1', 'R2', and 'R3' are connected in parallel.**	The voltages measured across 'R1', 'R2' and 'R3' will be different if 'R1', 'R2' and 'R3' have different values.	The total resistance equals R1 + R2 + R3.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1697	What statement is true concerning the 'MS 1' contacts of the master switch shown in the illustration?	**They are closed only when the master switch is 'off'.**	They are closed only when the master switch selected for a 'hoist' position.	They are opened only when the master switch is 'off'.	They are closed only when the master switch is selected for a 'lower' position.
1698	What statement is true concerning the specific gravity of the electrolyte solution in a lead acid battery?	the specific gravity is not effected during charging	the specific gravity remains the same during discharge	the specific gravity would read close to 1.830 when discharged	**the specific gravity gives an indication of the state of charge of the battery**
1699	What statement is TRUE concerning the speed of a synchronous ac propulsion motor?	The speed is inversely proportional to the frequency applied to its stator windings.	The speed is directly proportional to the frequency applied to its rotor windings	**The speed is directly proportional to the frequency applied to its stator windings.**	The speed is inversely proportional to the frequency applied to its rotor windings.
1700	What statement is true concerning the speed of a wound-rotor induction motor?	The speed will be fixed by the number of field poles.	**The speed can be varied by a rheostat-type control.**	The speed can only be synchronous speed at full load.	The speed can only attain synchronous speed at no load.
1701	What statement is true concerning the total power consumed in a series circuit?	Total power is the sum of the powers consumed by each load (resistor) divided by the number of loads	**Total power is the sum of the powers consumed by each load**	Total power is always less than the power consumed by the smallest load	Total power is never more than the power consumed by the largest load
1702	What statement is true concerning the total resistance of a parallel circuit?	The total resistance is larger than that of the branch with the greatest resistance.	**The total resistance is smaller than that of the branch with the lowest resistance.**	The total resistance is equal to the sum of the individual branch resistances.	The total resistance is equal to the sum of the individual branch resistances divided by the number of branches.
1703	What type of AC motor would use a rheostat in the rotor circuit to vary the speed of the motor?	squirrel-cage induction motor	regenerative braking motor	**wound-rotor induction motor**	synchronous motor
1704	What type of auto-pilot control system is shown in figure "A" of the illustration?	**proportional control**	derivative control	integral control	combination proportional-derivative control
1705	What type of auto-pilot control system is shown in figure "B" of the illustration?	proportional control	derivative control	integral control	**combination proportional-integral-derivative control**
1706	What type of circuit is represented by the diagram shown in the illustration?	dual speed, 2-winding motor controller circuit	**navigation running light circuit**	uninterruptible power supply circuit	common fluorescent lighting circuit
1707	What type of circuits are shown in the illustration?	megohm meter	Gauss meter	**Wheatstone bridge**	germanium diode tester

ID #	Question	Choice A	Choice B	Choice C	Choice D
1708	What type of control circuit logic is featured in the electrical schematic diagram for the motor starting circuit shown in figure "B" of the illustration?	resistance starting	reduced voltage starting	**low voltage protection**	low voltage release
1709	What type of DC motor is never connected to a belt driven load?	permanent magnet	**series wound**	shunt wound	compound wound
1710	What type of electric propulsion system converter is shown in the illustration?	controlled rectifier converter	pulse width modulation converter	**synchroconverter**	cycloconverter
1711	What type of electrical diagram is shown in both figures of the illustration?	schematic diagram	wiring diagram	**logic diagram**	one line diagram
1712	What type of electrical diagram is shown in figure "A" of the illustration?	**connection wiring diagram**	elementary schematic diagram	one line diagram	logic diagram
1713	What type of electrical diagram is shown in figure "A" of the illustration?	logic diagram	schematic diagram	one line diagram	**wiring diagram**
1714	What type of electrical diagram is shown in figure "B" of the illustration?	logic diagram	**schematic diagram**	one line diagram	wiring diagram
1715	What type of equipment does the wiring diagram shown in the illustration represent?	engine order telegraph circuit	rudder angle indicator arrangement	engine speed tachometer with repeaters	**sound powered telephone system**
1716	What type of feedback is featured in the transistor amplifier shown in figure "B" of the illustration assuming that the phase relationship between input and output is identical to the transistor amplifier shown in figure "A"?	positive feedback also known as degenerative feedback	positive feedback also known as regenerative feedback	**negative feedback also known as degenerative feedback**	negative feedback also known as regenerative feedback
1717	What type of filtering does the circuit shown in figure "B" of the illustration represent? ?	Capacitor filter	**LC choke-input filter**	Resistor-capacitor (RC) filter	LC capacitor-input filter
1718	What type of filtering does the circuit shown in figure "D" of the illustration represent? ?	Capacitor filter	LC choke-input filter	Resistor-capacitor (RC) filter	**LC capacitor-input filter**
1719	What type of logic gate is indicated by the truth table shown in figure "A" the illustration?	OR	**AND**	NOR	NAND
1720	What type of logic gate is indicated by the truth table shown in figure "B" the illustration?	**OR**	AND	NOR	NAND
1721	What type of logic gate is indicated by the truth table shown in figure "C" the illustration?	OR	AND	NOR	**NAND**
1722	What type of logic gate is indicated by the truth table shown in figure "D" the illustration?	OR	AND	**NOR**	NAND
1723	What type of logic gate is indicated by the truth table shown in figure "E" of the illustration?	OR	**Exclusive OR**	NOR	Exclusive NOR
1724	What type of motor enclosure is utilized for the motor labeled "A" of the illustration?	Open	Open, drip-proof	Totally enclosed	**Totally enclosed, fan-cooled**
1725	What type of motor enclosure is utilized for the motor labeled "B" of the illustration?	**Open**	Open, drip-proof	Totally enclosed	Totally enclosed, fan-cooled
1726	What type of motor enclosure is utilized for the motor labeled "C" of the illustration?	Open	**Open, drip-proof**	Totally enclosed	Totally enclosed, fan-cooled

ID #	Question	Choice A	Choice B	Choice C	Choice D
1727	What type of motor enclosure is utilized for the motor labeled "D" of the illustration?	Open	Open, drip-proof	**Totally enclosed**	Totally enclosed, fan-cooled
1728	What type of motor is generally used in DC propulsion drive systems?	series wound	permanent magnet	**shunt wound**	differentially compounded
1729	What type of motor is illustrated by the schematic of figure "A" of the illustration and what type of starting relay is used?	**permanent split capacitor motor using no starting relay as none is required**	capacitor start, induction run motor using no starting relay as none is required	permanent split capacitor motor using a potential starting relay	capacitor start, capacitor run motor using no starting relay as none is required
1730	What type of motor is illustrated by the schematic of figure "A" of the illustration and what type of starting relay is used?	**resistive start, induction run (split phase) motor using a potential starting relay**	resistive start, induction run (split phase) motor using a current starting relay	capacitor start, induction run motor using a potential starting relay	resistive start, induction run (split phase) motor using a hot wire starting relay
1731	What type of motor is illustrated by the schematic of figure "B" of the illustration and what type of starting relay is used?	capacitor start, induction run motor using a potential starting relay	capacitor start, induction run motor using a current starting relay	**capacitor start, capacitor run motor using a potential starting relay**	capacitor start, capacitor run motor using a current starting relay
1732	What type of motor is illustrated by the schematic of figure "B" of the illustration and what type of starting relay is used?	resistive start, induction run (split phase) motor using a potential starting relay	resistive start, induction run (split phase) motor using a current starting relay	**capacitor start, induction run motor using a potential starting relay**	resistive start, induction run (split phase) motor using a hot wire starting relay
1733	What type of motor is shown in figure "A" of the illustration?	**Shunt wound DC motor.**	Series wound DC motor.	Compound wound DC motor.	Series wound AC motor.
1734	What type of motor is shown in figure "B" of the illustration?	Shunt wound DC motor.	Series wound DC motor.	**Compound wound DC motor.**	Series wound AC motor.
1735	What type of motor is shown in figure "C" of the illustration?	Shunt wound DC motor.	**Series wound DC motor.**	Compound wound DC motor.	Permanent magnet DC motor.
1736	What type of motor is used in the AC hoist controller as shown in the illustration?	stepper motor	squirrel cage induction motor	synchronous motor	**wound rotor induction motor**
1737	What type of power would be equivalent to the apparent power associated with a purely inductive circuit?	true power	lead power	induced power	**reactive power**
1738	What type of rotor is used in the split-phase family of single-phase motors?	Drum	Salient pole	**Squirrel-cage**	Wound-rotor
1739	What type of starter is represented in the electrical schematic shown in the illustration?	**across-the-line starter**	primary-resistor starter	autotransformer starter	part-winding starter
1740	What unit of measure is used to quantify electrical power?	ohms	volts	amps	**watts**
1741	What will be the effect of interchanging any two of the three rotor leads on a wound-rotor induction motor?	increase motor performance	decrease motor performance	reverse the motor rotation	**have no effect on the direction of rotation or motor performance**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1742	What will be the freezing point of the electrolyte in a fully charged lead-acid battery as compared to a discharged battery?	higher than in a discharged battery	**lower than in a discharged battery**	the same as in a discharged battery	there is no correlation between freezing point and the state of charge
1743	What will be the frequency of a three-phase, 16 pole, AC generator operating at 3000 revolutions per minute?	60 hertz	90 hertz	180 hertz	**400 hertz**
1744	What will be the impact of reduced voltage applied to a motor during the starting period?	decrease the starting current and decrease the acceleration time	**decrease the starting current and increase the acceleration time**	increase the starting current and increase the acceleration time	increase the starting current and decrease the acceleration time
1745	What will be the impact of reduced voltage applied to an AC induction motor during the starting period?	increase the starting current and increase the starting torque	increase the starting current and decrease the starting torque	**decrease the starting current and decrease the starting torque**	decrease the starting current and increase the starting torque
1746	What will be the output frequency of a three-phase, six pole, AC generator operating at 1800 revolutions per minute?	60 hertz	**90 hertz**	120 hertz	180 hertz
1747	What will be the phase angle difference between phases of a six-pole, three-phase, rotating field alternator?	60°	**120°**	180°	360°
1748	What will be the resulting current if a voltage of 132 VDC is applied to the load with the switch closed in the illustrated circuit in figure "A" where the resistance is 12 ohms?	0.090 amps	1.090 amps	**11 amps**	144 milliamps
1749	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 10,230 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.0107 amps**	0.951 amps	93 amps	10,340 amps
1750	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.1 amps	0.2 amps	**1 amps**	220 amps
1751	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit when the switch is closed?	.11 amps	1.31 amps	**9.17 amps**	122 amps
1752	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 17.8 ohms in figure "A" of the illustrated circuit when the switch is closed?	2.88 amps	**6.18 amps**	127.8 amps	161 amps
1753	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 237 ohms in figure "A" of the illustrated circuit when the switch is closed?	**.464 amps**	1.464 amps	2.154 amps	3.47 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
1754	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed?	.29 amps	**3.44 amps**	9.31 amps	142 amps
1755	What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	**.234 amps**	4.272 amps	580 amps	2,008 amps
1756	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 10,230 ohms in figure "A" of the illustrated circuit when the switch is closed?	**.010 amps**	.913 amps	103 amps	934 amps
1757	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.222.amps	0.982 amps	**1.018 amps**	2.018 amps
1758	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit when the switch is closed?	.107 amps	1.28 amps	**9.33 amps**	124 milliamps
1759	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 17.8 ohms in figure "A" of the illustrated circuit when the switch is closed?	.158 amps	5.82 amps	**6.29 amps**	129.8 amps
1760	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed?	.285 amps	**3.5 amps**	9.142 amps	144 amps
1761	What will be the resulting current when a voltage of 112 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	**.238 amps**	4.196 amps	582 amps	19.723 amps
1762	What will be the resulting current when a voltage of 115 VDC is applied a resistance of 17.8 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.133 amps	0.154 amps	2.755 amps	**6.46 amps**
1763	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 10,230 ohms in figure "A" of the illustrated circuit when the switch is closed?	**11.24 milliamps**	88.95 milliamps	103.45 milliamps	910.00 amps
1764	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	.225 amps	.965 amps	**1.045 amps**	2.045 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
1765	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit with the switch closed?	1.24 amps	**9.58 amps**	104.34 amps	127 amps
1766	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 237 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.352 amps	**0.485 amps**	1.485 amps	2.06 amps
1767	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 32 ohms with the switch closed in figure "A" of the illustrated circuit?	**3.59 amps**	8.90 amps	147.00 amps	278.26 amps
1768	What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.244 amps**	4.07 amps	5.85 amps	19.21 amps
1769	What will be the resulting current when a voltage of 12 VDC is applied to a capacitance of 470 microfarads in figure "C" of the illustrated circuit after the capacitor has had ample time to fully charge?	**0.0 amps**	0.0255 amps	5.64 amps	25.5 amps
1770	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 10,230 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.012 amps**	0.844 amps	10.35 amps	82.50 amps
1771	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.887 amps	**1.127 amps**	2.13 amps	11.27 amps
1772	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit with the switch closed?	0.096 amps	1.16 amps	**10.33 amps**	136 amps
1773	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 17.8 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.143 amps	2.555 amps	**6.966 amps**	141.8 milliamps
1774	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 237 ohms in figure "A" of the illustrated circuit when the switch is closed?	1.523 amps	1.911 amps	361 milliamps	**523.2 milliamps**
1775	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.258 amps	**3.875 amps**	8.258 amps	156 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
1776	What will be the resulting current when a voltage of 124 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.263 amps**	3.79 amps	594 amps	1,7814 amps
1777	What will be the resulting current when a voltage of 132 VDC is applied to a resistance of 10,230 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.013 amps**	0.792 amps	77.5 milliamps	10.362 amps
1778	What will be the resulting current when a voltage of 132 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.833 amps	**1.2 amps**	2.2 amps	242 milliamps
1779	What will be the resulting current when a voltage of 132 VDC is applied to a resistance of 237 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.557 amps**	1.236 amps	2.048 amps	4.200 amps
1780	What will be the resulting current when a voltage of 132 VDC is applied to a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.242 amps	1.64 amps	**4.125 amps**	7.757 amps
1781	What will be the resulting current when a voltage of 132 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.280 amps**	1.673 amps	3.560 amps	602 milliamps
1782	What will be the resulting current when a voltage of 25 VDC is applied to a resistance of 105.3 ohms in figure "A" of the illustrated circuit when the switch is closed?	**0.237 amps**	1.237 amps	4.212 amps	130.3 amps
1783	What will be the resulting current when a voltage of 442.7 VDC is applied to a resistance of 1.25 ohms in figure "A" of the illustrated circuit when the switch is closed?	28.25 amps	35.32 amps	**354.16 amps**	443.62 amps
1784	What will be the resulting current when a voltage of 95 VDC is applied a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed?	.336 amps	**2.968 amps**	63 amps	127 amps
1785	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 10.23 k ohms in figure "A" of the illustrated circuit when the switch is closed?	**9.29 milliamps**	9.29 amps	10.32 amps	11.02 amps
1786	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 110 ohms in figure "A" of the illustrated circuit when the switch is closed?	0.205 amps	**0.863 amps**	1.16 amps	1.863 amps

ID #	Question	Choice A	Choice B	Choice C	Choice D
1787	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit when the switch is closed?	1.515 amps	6.126 amps	**7.916 amps**	107 amps
1788	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 17.8 ohms in figure "A" of the illustrated circuit when the switch is closed?	.187 amps	3.34 amps	**5.34 amps**	112.8 amps
1789	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 237 ohms in figure "A" of the illustrated circuit when the switch is closed?	1.40 amps	2.49 amps	332 milliamps	**400.8 milliamps**
1790	What will be the resulting current when a voltage of 95 VDC is applied to a resistance of 470 ohms in figure "A" of the illustrated circuit when the switch is closed?	4.95 amps	**202.2 milliamps**	565.00 milliamps	2,325 milliamps
1791	What will be the resulting total current if a voltage of 125 VDC is applied to the loads of the circuit in figure "A" of the illustration where the resistance of R1 is 12 ohms, and R2 is 115 ohms?	**11.5 amps**	12.5 amps	115 amps	125 amps
1792	What will be the status of the two synchronizing lamps as shown in circuit "C" of the illustration at the instant when the waves are in synchronism as shown in graph "A"?	**Both lamps will be in the middle of their dark period.**	Both lamps will in the middle of the their bright period.	The lamp on the left will be in the middle of its dark period and the lamp on the right will be in the middle of its bright period.	The lamp on the left will be in the middle of its bright period and the lamp on the right will be in the middle of its dark period.
1793	What will be the total current in figure "B" of the illustrated circuit with the switch closed if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	**2 amps**	6 amps	8 amps	10 amps
1794	What will cause the resistance of electric wire to decrease?	length increases	**cross-sectional area increases**	temperature increases	percent of metallic purities increases
1795	What will happen if you reverse both the field and the armature connections of a DC propulsion motor?	the direction of motor rotation will change	the brushes will become overheated	a magnetic lock will occur in the motor	**the direction of motor rotation will remain the same**
1796	What will happen to a carbon resistor operating in electrical equipment that is NOT properly cooled?	it will change its value inversely proportional to the amount of heat generated and time in service	its reliability factor will increase	**its reliability factor will decrease**	it will always operate at the same ohmic value

ID #	Question	Choice A	Choice B	Choice C	Choice D
1797	What will happen to a copper wire when the current flow through the wire increases in value?	resistance will decrease	insulation will burn	**temperature will increase**	conductivity will increase
1798	What will happen to an electrical coil when the direct current flowing through the coil is increasing?	the increasing current reduces the amount of flux produced	the increasing current changes the coil's impedance	the increasing current reduces the power consumed	**the increasing current produces a voltage in opposition to the applied voltage**
1799	What will happen to the primary winding when the load increases on the secondary windings of a transformer?	There will be a decrease in the primary voltage.	There will be an increase in the primary voltage.	There will be a decrease in the primary current.	**There will be an increase in the primary current.**
1800	What will happen to the total circuit resistance when additional parallel circuits are added to a circuit?	it will increase, causing a drop in the total load current	it will increase, causing a decrease in the line voltage	it will decrease, causing an increase in the line voltage	**it will decrease, causing an increase in the total load current**
1801	What will happen when a loss of field excitation to an AC generator occurs while operating in parallel?	It will absorb more and more load due to decreased armature reaction.	It will lose its load due to the inherent speed droop built into the governor.	It will smoke and overload due to field flashover as residual field flux changes polarity.	**It will lose its load and possibly overspeed.**
1802	What will result in an alternator failing to produce line voltage?	a closed circuit breaker	oxidized slip rings	improperly staggered brushes	**excitation field failure**
1803	What will the charging of lead-acid storage batteries always result in?	dangerous acid burns	**a dangerously explosive gas being liberated**	the danger of lead poisoning	local action
1804	What will the resulting current be when a voltage of 115 VDC is applied across a resistance of 1.74 ohms when the switch is closed in figure "A" of the illustrated circuit?	0.015 amps	0.026 amps	**66.09 amps**	116.74 amps
1805	What would be a useful instrument for checking the performance of an operating poly phase AC motor?	hand or battery-operated megger	vibrating-reed frequency meter	**clamp-on ammeter**	D'Arsonval iron-vane probe
1806	What would be the best tool to use to remove a ball bearing from the shaft of an electric motor?	rawhide hammer	brass mallet	**wheel puller**	wooden mallet
1807	What would be the capacitive reactance of the circuit shown in figure "A" of the illustration if the capacitance of C1 was 200 microfarads, the capacitance of C2 was 400 microfarads and the frequency of the source was 60 cycles per second (Hz)?	1.2 ohms	2.3 ohms	**4.4 ohms**	8.8 ohms
1808	What would be the capacitive reactance of the circuit shown in figure "A" of the illustration if the capacitance of C1 was 50 microfarads, the capacitance of C2 was 100 microfarads and the frequency of the source was 60 cycles per second (Hz)?	8.8 ohms	**17.7 ohms**	39.8 ohms	79.7 ohms

ID #	Question	Choice A	Choice B	Choice C	Choice D
1809	What would be the capacitive reactance of the circuit shown in figure "A" of the illustration if the capacitance of C1 was 100 microfarads, the capacitance of C2 was 200 microfarads and the frequency of the source was 60 cycles per second (Hz)?	**8.8 ohms**	17.7 ohms	39.8 ohms	79.6 ohms
1810	What would be the capacitive reactance of the circuit shown in figure "A" of the illustration if the capacitance of C1 was 100 microfarads, the capacitance of C2 was 200 microfarads and the frequency of the source was 60 cycles per second (Hz)?	19.9 ohms	**39.8 ohms**	79.6 ohms	159.2 ohms
1811	What would be the diameter of a conductor with a cross-sectional area of one circular mil?	0.1 inches	0.01 inches	**0.001 inches**	0.0001 inches
1812	What would be the effect of carrying field excitation excessively high on a synchronous motor?	a tendency for the motor to fall out of step	a tendency for the motor to overspeed	**a tendency for the motor to overheat**	a loss of motor speed regulation
1813	What would be the indication of a burned-out LED?	excessive output	a slight glow in the crystal	excessive illumination	**no illumination**
1814	What would be the indication of a grounded switch or cable as measured by a megohmmeter?	infinity	**'zero'**	being unsteady in the high range	being unsteady in the low range
1815	What would be the most likely fault if a single-phase permanent split capacitor induction motor fails to start?	**an open start winding**	an open start capacitor	a closed centrifugal switch	an open centrifugal switch
1816	What would be the ohmic value of a carbon resistor if the color bands 1, 2, 3, and 4 were yellow, green, orange, and gold respectively.	42.75 to 47.25 ohms	4,275 to 4,725 ohms	**42,750 to 47,250 ohms**	427,500 to 472,500 ohms
1817	What would be the ohmic value of a carbon resistor if the color bands 1, 2, 3, and 4 were yellow, violet, red, and gold respectively.	44.65 to 49.35 ohms	**4,465 to 4,935 ohms**	44,650 to 49,350 ohms	446,500 to 493,500 ohms
1818	What would be the power consumed in the combined parallel section of the circuit shown in the illustration if the source voltage was 30 volts and the resistance for R1 is 10 ohms, R2 is 10 ohms, and R3 is 10 ohms, respectively?	5 watts	10 watts	**20 watts**	40 watts
1819	What would be the resistance tolerance of a carbon resistor which is color coded as red, violet, brown, and silver in bands 1 thru 4 respectfully as shown in figure "A" of the illustration?	1%	5%	**10%**	20%
1820	What would be the resistance value of the load in figure "A" of the illustrated circuit if the current was .05 amps and the source voltage was 25 volts with the switch closed?	1.25 ohms	5 ohms	12.5 ohms	**500 ohms**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1821	What would be the source current and transformer current as shown in figure "B" of the illustration, with the secondary tap connected as shown, if the supply voltage at the branch circuit breaker is 440 VAC and the unity power factor load current draw is 50 amps?	source current is 37.5 amps transformer current is 12.5 amps	source current is 37.5 amps transformer current 92.5 amps	**source current is 12.5 amps** **transformer current is 37.5 amps**	source current is 12.5 amps transformer current is 62.5 amps
1822	What would be the source voltage of the illustrated circuit in figure "A" if the current flow with the switch closed was 6 amps and the resistance was 180 ohms?	0.033 volts	3 volts	30 volts	**1080 volts**
1823	What would be the terminal voltage and ampere-hour capacity of the battery bank if each battery was rated at 50 amp-hours and 6 volts?	6 volts and 50 ampere-hours	**12 volts and 100 ampere-hours**	12 volts and 200 ampere-hours	24 volts and 50 ampere-hours
1824	What would be the terminal voltage and ampere-hour capacity of the battery bank illustrated if each battery was rated at 200 amp-hours and 6 volts?	**12 volts and 400 amp-hours**	12 volts and 800 amp-hours	24 volts and 400 amp-hours	24 volts and 800 amp-hours
1825	What would be the terminal voltage and ampere-hour capacity of the battery bank illustrated if each battery was rated at 50 ampere-hours and 12 volts?	12 volts and 50 ampere-hours	12 volts and 100 ampere-hours	24 volts and 50 ampere-hours	**24 volts and 100 ampere-hours**
1826	What would be the terminal voltage and ampere-hour capacity of the battery bank illustrated if each battery was rated at 75 ampere-hours and 12 volts?	24 volts and 75 ampere-hours	**24 volts and 150 ampere-hours**	12 volts and 150 ampere-hours	48 volts and 300 ampere-hours
1827	What would be the total capacitance of the circuit illustrated in figure "A" if the value of capacitor C1 was 100 microfarads and capacitor C2 was 200 microfarads?	**66.6 microfarads**	150 microfarads	166.6 microfarads	300 microfarads
1828	What would be the total capacitance of the circuit illustrated in figure "A" if the value of capacitor C1 was 100 microfarads and capacitor C2 was 200 microfarads?	66.6 microfarads	150 microfarads	166.6 microfarads	**300 microfarads**
1829	What would be the total capacitance of the circuit illustrated in figure "A" if the value of capacitor C1 was 100 microfarads and capacitor C2 was 50 microfarads?	**33.3 microfarads**	66.6 microfarads	150 microfarads	5000 microfarads
1830	What would be the total capacitance of the circuit illustrated in figure "A" if the value of capacitor C1 was 100 microfarads and capacitor C2 was 50 microfarads?	75 microfarads	**150 microfarads**	2500 microfarads	5000 microfarads

ID #	Question	Choice A	Choice B	Choice C	Choice D
1831	What would be the total current flowing in the circuit shown in figure "B" of the illustration if the source is 30 volts, the resistance of R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms, respectively?	1 amp	**2 amps**	5 amps	15 amps
1832	What would be the total current in figure "A" of the circuit illustrated if the value of capacitor C1 was 100 microfarads, capacitor C2 was 200 microfarads and the power supply was 240 volts at 60 Hz?	**27 amps**	37 amps	47 amps	57 amps
1833	What would be the total current in figure "A" of the circuit illustrated if the value of capacitor C1 was 100 microfarads, capacitor C2 was 200 microfarads and the power supply was 240 volts at 60 Hz?	0.603 amps	3.01 amps	**6.03 amps**	12.06 amps
1834	What would be the total power consumed in the circuit shown in figure "B" of the illustration if the source is 30 volts, the resistance for R1 is 10 ohms, R2 is 10 ohms, and R3 is 10 ohms?	10 watts	40 watts	45 watts	**60 watts**
1835	What would be the voltage drop across the parallel branches of the circuit shown in figure "B" of the illustration if the source voltage is 30 volts, the resistance for R1 is 10 ohms, the resistance for R2 is 10 ohms and the resistance for R3 is 10 ohms?	5 volts	**10 volts**	20 volts	30 volts
1836	What would be the voltage drop across the series resistor of the circuit shown in figure "B" of the illustration if the source is 30 volts, the resistance of R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms?	5 volts	10 volts	**20 volts**	30 volts
1837	What would cause a fuse to blow?	an electric motor is stopped suddenly by opening a switch	the flow of current to the protection device is reversed	**the electrical current exceeds the rated value of the fuse**	unequal resistors are connected in parallel
1838	What would cause a lead-acid battery to become hotter than normal during charging?	**excessive charging current**	the charging voltage is too low	the specific gravity is too high	the battery room door is secured
1839	What would cause a three-phase, squirrel cage, induction motor to run hot? I. Operating at lower than rated voltage II. Operating at higher than rated voltage	I only	II only	**Either I or II**	Neither I nor II

ID #	Question	Choice A	Choice B	Choice C	Choice D
1840	What would cause a three-phase, squirrel cage, induction motor to run hot? I. Operation at lower than rated voltage II. Operation at lower than rated frequency	I only	II only	**Either I or II**	Neither I nor II
1841	What would excessive sparking at the brushes of a running DC motor be an indication of?	normal operation	**a dirty commutator**	increased brush capacity	water vapor absorption
1842	What would you use to determine the state of charge of a nickel-cadmium battery?	**voltmeter**	hydrometer	ammeter	potentiometer
1843	When a battery is continuously exposed to low temperatures, what is the best procedure to keep it from freezing?	remove the battery caps	securely cover the battery	**keep the battery fully charged**	disconnect the battery
1844	When a console indicating lamp burns out, attempts to renew it should not be made while maneuvering. Why is this so?	the new lamp may be of a higher wattage and cause heat damage to the lens	removing a faulty lamp usually causes an alarm to sound on the bridge	attention should be paid only to engine orders	**a socket/wiring fault may cause a ground or short circuit to shut down a vital function**
1845	When a fluorescent lamp fails to light and both ends of the tube are severely darkened, what must usually be replaced?	**the fluorescent lamp tube**	the starter	the ballast	the circuit breaker
1846	When a fluorescent lamp has reached the end of its useful life, it should be replaced immediately. If not, what condition could the resultant flashing cause?	tripping of the lamp's circuit breaker	exploding of the lamp, causing glass to fly in all directions	short circuiting of adjacent lighting circuits	**damaging the lamps starter and ballast circuit**
1847	When a hydrometer indicates specific gravity what is being compared?	density of a substance in water with the density of the same substance in air	differences in weight between water and the mass of the liquid being measured	mass of substance measured with the density of the same substance	**buoyancy of the indicator in the liquid being measured as compared to water**
1848	When a low input voltage is delivered to a transformer which then produces a high output voltage, what is the proper name for the transformer type?	primary transformer	secondary transformer	step-down transformer	**step-up transformer**
1849	When a megohmmeter is being used on a alternating current machine, under certain conditions the meter pointer will dip toward 'zero' and then gradually rise to the true resistance value of the motor insulation. What does this indicate, in terms of the machine windings?	they are grounded	**they are good**	they are shorted	they are dirty
1850	When a megohmmeter is being used to test insulation resistance, current leakage along the surface of the insulation is indicated by a very specific megohmmeter pointer movement. What would be the characteristic of the pointer movement under these conditions?	fluctuating around a constant resistance reading	dipping towards 'zero', then rising slowly	**kicking slightly downscale as voltage is applied**	continually rising as the test voltage is applied

ID #	Question	Choice A	Choice B	Choice C	Choice D
1851	When a megohmmeter is being used to test insulation resistance, current leakage along the surface of the insulation is indicated by the megohmmeter's pointer responding in a very unique way. What would be the response of the pointer?	dipping toward zero then raising slowly	continually rising as test voltage is applied	**kicking slightly down scale as voltage is applied**	fluctuating around a constant resistance reading
1852	When a megohmmeter is used to test insulation, what condition causes the gradual rise of the pointer reading as a result of continued cranking?	good conductor resistance	the leakage of current along the surface of dirty insulation	the inductive reactance of the windings	**the dielectric-absorption effect of the insulation**
1853	When a megohmmeter is used to test the dielectric strength of wire insulation, what causes the initial dip of the pointer toward 'zero'?	good insulation	the leakage of current along the surface of dirty insulation	**the capacitance of the circuit**	the dielectric absorption effect of the insulation
1854	When a megohmmeter is used to test the insulation of a large motor, what causes the initial dip of the pointer toward 'zero'?	good insulation	**the capacitance of the windings**	the leakage of the current along the surface of dirty insulation	the dielectric-absorption effect of the insulation
1855	When a megohmmeter is used to test the winding insulation of a large motor, what causes an initial dip of the pointer toward 'zero'?	an open in the winding being tested	weak batteries in the meter	the absence of current along the surface of clean insulation	**the capacitance of the winding**
1856	When a motor is started by the controller shown in figure "C" of the illustration, what circuit components are in the holding current flow path through the control circuit while the motor is in operation?	the stop button contacts, the "A2" contacts, the "M" coil and the "OL" contacts	**the stop button contacts, the "B1" contacts, the "M" contacts, the "M" coil and the "OL" contacts**	the stop button contacts, the "A1" contacts, the "M" coil and the "OL" contacts	the stop button contacts, the "B2" contacts, the "M" contacts, the "M" coil and the "OL" contacts
1857	When a nickel-cadmium battery begins gassing while connected to the battery charging circuit, what should be done?	**do nothing as this is a normal condition when charging**	add distilled water to each cell to reduce the specific gravity of the electrolyte	add potassium hydroxide to each cell to increase the specific gravity of the electrolyte	increase the charging rate
1858	When a nickel-cadmium battery begins gassing while connected to the battery charging circuit, what should be done?	**do nothing as this is a normal condition when charging**	add distilled water to each cell to increase the specific gravity of the electrolyte	add potassium hydroxide to each cell to reduce the specific gravity of the electrolyte	increase the charging rate
1859	When a resistor is used as a shunt and is connected in parallel with a meter movement coil, what capability does this provide?	a measurement of circuit resistance	an increased accuracy of approximately 1.5 percent	**an extended meter range**	this is never done

ID #	Question	Choice A	Choice B	Choice C	Choice D
1860	When a shunt wound DC motor is operating at or near rated speed, what is the amount of mechanical power developed by the motor dependent upon? I. The mechanical load on the motor II. The current drawn by the armature	I only	II only	**Both I and II**	Neither I nor II
1861	When a solid-state component of an electronic circuit is mounted to a metallic mass, what is the general purpose of that mass?	prevent vibration damage to delicate components	prevent mechanical damage to solid-state components	dissipate stray magnetic currents	**act as a heat sink**
1862	When a transformer is used to step down voltage, what statement is true?	The low voltage winding is part of the core.	The low voltage winding is the primary coil.	The low voltage winding is not insulated.	**The low voltage winding is the secondary coil.**
1863	When AC voltage of a fixed frequency and voltage as shown in figure "D' is applied to the input of the single phase controlled rectifier shown in figure "C", what determines the average DC current output value as controlled at any given time?	the controlled DC pulse frequency	the controlled DC peak current value	**the controlled timing of the gate control pulses**	the controlled value of the continuously applied gate voltage
1864	When an AC or a DC motor fails to start, besides checking for blown fuses or a tripped circuit breaker, what should be the FIRST step in troubleshooting the cause?	check the motor windings for obvious opens	check the motor controller leads for continuity	**check the overload relay**	check the motor controller leads for grounds
1865	When an alternator is to remain idle for even a few days, what should be done?	lift the brushes and disconnect the pigtails	insulate the collector rings with strips of cardboard	**energize the space heater circuit**	open the equalizing bus disconnect switch
1866	When changing fuses, what safety precaution should be taken?	wear rubber boots	**use a fuse puller**	stand on a rubber mat	wear safety glasses
1867	When charging a 100 amp-hour lead-acid battery, what statement is true?	insure that the electrolyte level is below the top of the plates	**insure adequate battery room ventilation**	insure that violent gassing occurs	always start with a trickle charge rate
1868	When charging lead-acid batteries, why should the charging rate should reduced as the battery nears its full charge?	**to prevent damaging battery plates**	to allow equalization of cell voltages	to reduce lead sulfate deposits	to increase lead peroxide formation
1869	When charging lead-acid batteries, why should you reduce the charging rate as the battery nears its full charge capacity?	**to prevent excessive gassing and overheating**	to allow equalization of cell voltages	to reduce lead sulfate deposits	to increase lead peroxide formation
1870	When charging, which of the following represents the recommended maximum allowable temperature for electrolyte in a lead-acid battery?	**110°F**	145°F	165°F	212°F

ID #	Question	Choice A	Choice B	Choice C	Choice D
1871	When checking the specific gravity of battery electrolyte with a hydrometer, which of the following statements is true?	The battery is fully charged when the indicator floats deep and low in the electrolyte.	Any water that has been previously added to the cells will increase the specific gravity of the solution.	**The hydrometer reading will be inaccurate if taken immediately after water is added to the cell.**	Temperature has no effect on hydrometer readings.
1872	When disassembling electric motors for maintenance or overhaul, what should be done FIRST?	punch mark frame and end bells for proper assembly	wrap bearings in lint free cloths if they are to be reused	tag and store small parts in a box	**tag-out and lock-out the motor**
1873	When electrical cables penetrate watertight bulkheads, what must be provided for?	cables should be grounded on either side of the bulkhead	cables must be bent to a radius of six diameters	**a watertight stuffing tube capable of accepting packing should be employed**	cables should be secured by a clamp
1874	When energizing a DC propulsion motor using "local override manual control", what statement best describes how the variable rheostat should be turned?	It should be turned all the way to the full run position then quickly back to slow.	**It should be turned to a position which initializes motor rotation and then turned back to the slow position.**	It should be turned quickly to the mid position.	It should be turned quickly to the full run position.
1875	When evaluating a functional amplifier, you measure an output of 30 volts. If the voltage gain of the amplifier is 2, what must the input voltage be for the amplifier to work properly?	32 volts	30 volts	28 volts	**15 volts**
1876	When insulation failure produces a low resistance current path between two conductors, the result is an electrical fault. What is this fault condition known as?	an open	**a short circuit**	a ground	a surge
1877	When is a lead-acid battery considered fully charged?	when the electrolyte gasses freely	when the battery charger ammeter indicates a positive reading	when the terminal voltage reaches a constant value at a given temperature	**when the specific gravity of all cells reaches the correct value and no longer increases over a period of 3 to 4 hours**
1878	When maintaining the circuits shown in figures "B" and "C" the illustration, other than the fact that the fluorescent tube glass fragments may cut a persons skin, what dangers are associated with component "4" should it become broken? I. The contained mercury vapor is highly toxic. II. The inside coating of phosphor is highly poisonous.	I only	II only	**Both I and II**	Neither I nor II

ID #	Question	Choice A	Choice B	Choice C	Choice D
1879	When maintenance personnel are working on electrical equipment, all supply switches should be secured in the open position and tagged. Who specifically should perform the lock-out/tag-out procedure?	watch engineer	chief engineer or first assistant	chief electrician	**person performing the repair**
1880	When measuring DC current flow using an analog or digital multimeter set up as a milliammeter, how is the meter connected?	**in series with the power source and load**	in parallel with the power source and load	insuring correct polarity	using the lowest range possible to prevent instrument damage
1881	When mixing electrolyte for a lead-acid storage battery, what cautionary measure must be taken?	stirring should always be avoided	a lead container should always be used	always pour the water into the acid	**always pour the acid into the water**
1882	When mixing electrolyte, which of the following precautions should always be observed?	**Add the acid to the water.**	Use a heavy duty aluminum pail.	Add the water to the acid.	Mix the solution outdoors.
1883	When paralleling two AC generators, the synchroscope selector switch and frequency meter switch should be set up to sense the frequency of which of the following?	bus	generator on the line	**oncoming generator**	bus transfer relay
1884	When paralleling two AC generators, what should be the frequency of the incoming generator, just prior to closing the circuit breaker?	slightly less than the frequency of the generator on the line	the same as the frequency of the generator on the line	**slightly more than the frequency of the generator on the line**	exactly 60 hertz regardless of the frequency of the generator on the line
1885	When paralleling two AC generators, what should be the frequency of the machine coming on-line, immediately prior to closing its breaker?	slightly less than the oncoming generator frequency	the same as the bus frequency	**slightly greater than the bus frequency**	much greater than the bus frequency
1886	When paralleling two alternators the synchronizing lamps grow dim and are totally darkened as the synchroscope pointer approaches the 0° position. What does this indicate?	the alternator voltages are 180° apart	the incoming alternator is running too fast	**the incoming alternator is in synchronism with the bus**	the synchroscope pointer is defective or broken
1887	When paralleling two alternators using three synchronizing lamps, the flickering of all three lamps becomes progressively slower and slower. What does this mean?	**The frequency of the incoming generator is approaching that of the bus.**	The frequency of the incoming alternator is significantly less than that of the bus.	The phase rotation of the incoming alternators is opposite to that of the bus.	The terminal voltage of the incoming alternator is approaching that of the bus.
1888	When paralleling two alternators, the synchronizing lamps remain lit as the synchroscope pointer approaches the 0°. What does this indicate?	the incoming alternator is running too fast	the alternator voltages are 180 degrees apart	**the synchroscope is defective or broken**	the alternator power factors are in phase

ID #	Question	Choice A	Choice B	Choice C	Choice D
1889	When performing D.C. motor brush replacements, close attention should be paid to what? I. Excessive brush play in the brush holder II. Brush length down to one-quarter of useful length	I only	II only	**Both I and II**	Neither I nor II
1890	When performing routine A.C. motor maintenance what should be included?	**temperature readings at normal loads to detect abnormal temperature rises**	inspection of the motor's internals for loose rotor bars or field poles	verifying RPM if a synchronous motor	rotor balance check
1891	When placed in a magnetic field, which of the materials listed will maintain the highest permeability?	Glass	Bakelite	**Soft iron**	Aluminum
1892	When portable cords are connected to devices such as portable tools, you must eliminate direct tension on the joints or terminals. According to 46 CFR, Subchapter J (Electrical Engineering) Coast Guard Regulations (46 CFR), how may this be provided for?	knotting or taping of the cords only	installation of a strain relief fitting only	**knotting or taping of cords or installation of strain relief fittings**	joints and terminals are required to handle the tension
1893	When power is restored after a complete power failure, how will the steering gear pump motor which was on-line respond?	it will have to be restarted manually	it will have to be reset manually	**it will restart automatically**	it will trip its overload relays
1894	When regreasing the electric motor bearing as shown in figure "B" of the illustration, what practice should be avoided?	**Completely filling the bearing cavity with new grease.**	Flushing out the old grease while running the motor with no load.	Flushing out the old grease with an approved solvent.	Only partially filling the bearing cavity with new grease.
1895	When removing ball or roller bearings from the shaft of a motor, what tool should be used?	rawhide hammer	brass mallet	**wheel puller**	soft iron pry bar
1896	When replacing a defective transformer in a paralleled transformer configuration, which of the following actions must be carried out to insure proper operation of the equipment it serves?	The secondary leads must be grounded for 10 minutes to remove static charges.	**The transformer connections must be made as before with regard to the indicated polarity.**	The iron core of the transformer must be flashed to pre-magnetize it.	The iron core must be grounded for 10 minutes to remove any residual magnetism.
1897	When replacing a fuse with one of a ampere higher rating than the original, which of the following is true?	**It endangers the apparatus it is supposed to protect.**	It reduces the possibility of short circuits.	It increases the efficiency of the equipment by allowing more current to be used.	It creates a larger voltage drop in the circuit being protected.
1898	When replacing a power transistor fitted with a heat sink in a circuit, a coating of silicone grease is applied between the transistor case and the heat sink. Why is this done?	lubricate the transistor	lubricate the heat sink	aid in the removal of the heat sink	**provide maximum heat transfer**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1899	When replacing fuses, what practice should be observed?	to stand on a rubber mat and use rubber gloves	to use insulated pliers or screwdriver	**the fuse clips are straight, tight, and in good contact**	to increase the fuse rating 10% to guard against 'nuisance blowing'
1900	When rolling over a DC main propulsion motor in local emergency mode or throttle bypass mode, what must be done with the variable rheostat in terms of turning the handle?	turn to the fast position until the armature begins to rotate and then turned back to slow	**turn a sufficient amount to assure armature rotation**	turn quickly to the mid position to energize the field	turn quickly to the fast position
1901	When securing an AC generator, what should be your FIRST action in accomplishing the procedural steps?	open the generator circuit breaker	switch the voltage regulator to 'manual'	decrease the field excitation to minimum	**reduce the load on the unit**
1902	When shore power is being connected to a ship in dry dock, what must be ensured, assuming that the ship's generators are rated at 450 VAC, 60Hz with a total capacity of 5000 kW?	shore power must be capable of delivering a total of 5000 kW	**shore power phase sequence must agree with that of the ship**	exactly 450 volts must be supplied from shore, as no tolerance is permitted	exactly 60 Hz must be supplied from shore, as no tolerance is permitted
1903	When should a hand-held portable phase sequence indicator be used?	installing a new power factor switchboard meter	**preparing to make the ships shore power connection**	replacing an auxiliary diesel engine electric cranking motor	replacing a cathodic hull protection anode
1904	When should cleaning of electrical insulation be accomplished?	every six months	very 12 months	**determined by need and not the calendar**	whenever the electrician is not otherwise busy
1905	When soldering a printed circuit board component, what should be done to help prevent damage?	slowly heating the joints, using a high wattage iron	**using the soldering iron tip sparingly**	using only acid core solder	applying mechanical pressure to the joints being soldered
1906	When testing a capacitor with an digital multimeter set up as an ohmmeter, what would be the indication on the display when testing an initially discharged capacitor in good condition?	the display would immediately show 'OL' ohms and remain at this value	the display would immediately show very low resistance and remain at this value	**the display would immediately show very low resistance but gradually climb to 'OL'**	the display would immediately show very low resistance but rapidly climb to a slightly higher value and remain there
1907	When testing for blown fuses in a three-phase supply circuit to a motor, what would be an acceptable method?	ensure the circuit is de-energized, and then use an ohmmeter or continuity tester connected across the bottoms of the fuses	ensure the circuit is de-energized, and then use an ohmmeter or continuity tester connected across the tops of the fuses	**apply a voltage tester diagonally across the tops of the fuses and the bottoms of the other fuses**	apply a voltage tester across the tops of the fuses

ID #	Question	Choice A	Choice B	Choice C	Choice D
1908	When testing the rotor of a synchronous motor for short circuits, a low voltage source is applied across the rotor coils through the collector rings. What would be the indication of a short-circuited coil?	high voltage drop reading, while the other coil readings will have an equal or lower value	**low or zero voltage drop reading, while the other coils will have higher readings**	fluctuating voltmeter reading, while the other coil readings are steady	steady voltmeter reading, while the other coil readings are fluctuating
1909	When the control handle is in the 'off' position, what is the status of the solenoid actuated brake of an electric winch?	de-energized and the brake is released	energized and the brake is released	energized and the brake is set by a spring	**de-energized and the brake is set by a spring**
1910	When the electrolyte level of a lead-acid storage battery has decreased due to normal evaporation, how is a normal the level re-established?	**adding distilled water only**	adding sulfuric acid only	adding a weak solution of sulfuric acid and distilled water	adding a strong solution of sulfuric acid and distilled water
1911	When the length and cross sectional area of a replacement wire are both tripled, what will be the value of the resistance as compared to the original wire?	increases nine fold	increases three fold	**remains the same**	decreases six fold
1912	When the motor shown in figure "A" of the illustration is running with jog-run switch in the run position and the stop button is pushed and then released, which of the following statements will hold true?	Coil "M" will de-energize when the stop button is pushed and re-energize when the stop button is released.	Coil "M" will energize when the stop button is pushed and de-energize when the stop button is released.	Coil "M" energize when the stop button is pushed and remain energized when the stop button is released.	**Coil "M" will de-energize when the stop button is pushed and remain de-energized when the stop button is released.**
1913	When the operating handle of a molded case circuit breaker is in the mid-position, what is the indication of the circuit breaker position?	it is in the 'opened' position	it is in the 'closed' position	**it is in the 'tripped' position**	it is in the 'reset' position
1914	When the operating handle of a molded-case circuit breaker is in the mid-position, what does this indicate?	the circuit breaker is switched on	the circuit breaker is switched off	the circuit breaker has been reset	**the circuit breaker has tripped**
1915	When the operating handle of a molded-case circuit breaker is in the mid-position, what is the indication for the position of the circuit breaker?	in the 'closed' position	in the 'opened' position	**in the 'tripped' position**	in the 'reset' position
1916	When there is a fire in a large electric motor, what is normally the very FIRST step to perform?	**secure the electric supply**	ventilate area to remove smoke	start the fire pump and lead out hose	apply foam
1917	When three-phase AC power is supplied to the device shown in figure "A" of the illustration, what is the characteristic of the output?	single-phase AC	split-phase AC	three-phase DC	**unidirectional DC**
1918	When troubleshooting a console circuit card suspected of being faulty, what would be the last thing to do if all else fails to reveal the problem?	check the fuses and voltage levels of all power supplies in the console	clean dust and debris from the card and burnish the sliding connections	make sure all connections are tight including wire wrappings and push-on types	**substitute a new or repaired spare card and check the operation of the circuit**

ID #	Question	Choice A	Choice B	Choice C	Choice D
1919	When troubleshooting a console circuit card suspected of being faulty, you should first check for proper operating voltages, followed by cleaning the card. Then what should be done?	**make sure wired connections and push-on connectors are tight**	test each resistor and capacitor on the card with an ohmmeter	check the continuity of all printed circuit traces with an ohmmeter	measure the gain of each transistor or integrated circuit
1920	When troubleshooting a console circuit card suspected of being faulty, you should first check for proper voltages to the card. What should be done next?	test transistors or integrated circuits for gain and compare with manufacturer's specifications	blow any accumulated dust from the card with at least 30 psi air from the ship's service air system	**pull the card, clean the sliding connections with a pencil eraser, and remove accumulated dust**	de-energize the card and check the printed circuit traces for continuity with an ohmmeter
1921	When troubleshooting a console circuit card which is suspected of being faulty, what would be a logical first step?	pull the card and measure the value of all resistors	check for the correct value and polarity of all power connections to the card	**de-energize and pull the card to visually inspect for burned components**	check for continuity of circuit board traces and then the gain of each transistor
1922	When troubleshooting a lead-acid storage battery, what is the best method for detecting a weak or dead cell?	**comparing the specific gravity of the electrolyte in each cell**	taking an open circuit voltage test of individual cells	visually inspecting the electrolyte levels of each cell	taking each cell's temperature with a calibrated mercury thermometer
1923	When troubleshooting a magnetic controller, it is found that the contacts are welded together. What is the most probable cause?	excessive operation at low load	high ambient temperature	**low voltage on the operating coil**	high voltage on the operating coil
1924	When troubleshooting a motor controller, all indications are that a relay coil should be energized. If there was no magnetic pull, with rated voltage measured across the coil, what would be the most probable cause?	**coil is open**	control fuse is open	auxiliary contact in series with the coil is defective	relay armature is stuck
1925	When troubleshooting AC motors, what can a portable growler be used to locate?	open field coils	grounded field coils	grounded stator coils	**shorted stator coils**
1926	When troubleshooting an alkaline storage battery, what is the best way to locate a weak or dead cell?	checking the specific gravity of each cell	visually inspecting each cell's electrolyte level	**load testing each cell with a voltmeter**	measuring the electrolyte temperature with an accurate mercury thermometer
1927	When troubleshooting an electronic circuit, an unreliable high resistance "cold" solder joint can be located with the aid of an ohmmeter. Once the problem has been located, what should be done?	reheat the circuit in an oven to an even temperature and recheck with an ohmmeter	reheat the connection with a match and recheck with an ohmmeter	**reheat connection with a soldering tool and recheck with an ohmmeter**	do nothing as this is the normal condition
1928	When troubleshooting electronic equipment, what should be the FIRST step taken before testing any circuit voltages?	set the meter to the lowest range	**check the voltage supply from the power source**	remove the suspected component	check the current flow through the circuit

ID #	Question	Choice A	Choice B	Choice C	Choice D
1929	When troubleshooting electronic equipment, why should you use a high impedance multimeter?	to prevent excess current flow through the meter that would damage it	for AC measurements only and a low resistance meter for DC measurements	whenever a low impedance meter is not available, regardless of the components being tested	**so as not to load down the circuit and obtain erroneous voltage readings**
1930	When troubleshooting most electronic circuits, what voltmeter characteristic can minimize the 'loading effect'?	**input impedance much greater than the impedance across which the voltage is being measured**	input impedance much less than the impedance across which the voltage is being measured	sensitivity of less than 1000 ohms/volt	sensitivity of more than 1000 volts/ohm
1931	When troubleshooting motor controllers, what is a shorted relay or contactor coil often indicated by?	a resistance reading of 'infinity' on an ohmmeter	**charred insulation and/or a blown control fuse**	a reading of 'zero' on a megger from one of the coil's leads to ground	a higher-than-normal voltage reading across the winding
1932	When two generators are on the line and are both connected across a shared load, how are they said to be operating?	in frequency	in series	**in parallel**	in resonance
1933	When two generators are operating in parallel, what will first occur if the engine driving generator #1 suddenly loses power?	Generator #1 circuit breaker will trip on overload.	**Generator #1 circuit breaker will trip on reverse power.**	Generator #2 will motorize.	Generator #2 engine will automatically shut down.
1934	When used for taking resistance measurements, a portable analog or digital multimeter is normally powered by what source?	a hand cranked generator	**internal storage batteries**	the current in the circuit being tested	a step down transformer
1935	When using a megohmmeter to determine which shunt field coil is grounded in a DC machine, what must you do?	insulate the field frame from the ship's hull	**disconnect each shunt field coil before testing**	use a motor driven high capacity megohmmeter	remove all main line lead connections before testing
1936	When using a megohmmeter to test insulation, what will be the indication of good insulation?	slight kicks of the needle down scale	**a downward dip followed by a gradual climb to the true resistance value**	a gradual rise in the pointer reading at the outset	the initial dip of the pointer
1937	When using a megohmmeter to test the dielectric strength of wire insulation, a continuous series of slight downscale kicks by the pointer results. What does this indicate?	good insulation	**the leakage of current along the surface of dirty insulation**	the capacitance of the windings	the dielectric-absorption effect of the insulation
1938	When using an analog multimeter set up as an ohmmeter for resistance measurements, it should be calibrated by clipping the loose ends of the leads together followed by what procedure?	**setting the instrument pointer at 'zero' ohms**	adjusting the line voltage to calibrate the instrument	plugging each end of one test lead into the plus and minus terminals	using a special purpose resistance measuring instrument (a bridge)

ID #	Question	Choice A	Choice B	Choice C	Choice D
1939	When using an ohmmeter to test a semiconductor diode, you find a low resistance in both the forward and reverse bias directions. What condition does this indicate?	an open	**a short**	good resistive quality	good capacitive quality
1940	When using the test set-up shown in figure "A" of the illustration, besides the motor windings and the motor feeder cable, what circuit components are actually being meggered?	the entire starter, including the power and control circuits, up to the load side of the disconnect switch	the power circuit of the starter up to the load side of the disconnect switch	**the power circuit of the starter up to the load side of the main contacts**	The power circuit of the starter up to the load side of the overload relay heaters
1941	When voltage and current developed in an AC circuit reach their peak values at the same time, how is the power factor characterized?	lagging	leading	**maximum**	minimum
1942	When will the timer element of a reverse power relay activate the relay?	**the power flow is the same as the tripping direction**	the power flow is the opposite to the tripping direction	the movement of the disk is damped by a permanent magnet	the load difference between generators is more than 10 percent.
1943	When working on a high voltage circuit, you should always have another person present with you. This person should have a good working knowledge of the hazards associated with working on high voltage electrical circuits as well as the first aid techniques for treating electrical shock. What other knowledge is essential?	**working knowledge of the circuit being worked on and all means of isolation and grounding**	detailed knowledge of insulation dielectric strengths associated with the circuit being worked on	working knowledge of the conductor ampacities associated with the circuit being worked on	detailed knowledge of the insulation voltage ratings associated with circuit being worked on
1944	When working on electrical circuits containing large capacitors, in addition to de-energizing the circuit, which of the listed precautions should also be taken?	Keep all radio equipment away.	Measure capacitor insulation resistance.	**Discharge the capacitor through a 50,000 ohm resistor.**	Check capacitor circuit polarity.
1945	When would be the safest time to close the ships main switchboard "shore power" circuit breaker?	only after the ship's generators have been directly paralleled to those on shore	at any time in a shipyard	if a quick disconnect coupling is used	**when the ship's generators have been disconnected from the main bus**
1946	When you are making a high potential test (megger) on the motor coils of repaired electrical machinery to ground. What would a low resistance reading indicate?	good insulation	**bad insulation**	high insulation power factor	a high slot discharge factor
1947	Where automatic restart does not present a hazard after a power failure, according to 46 CFR, Subchapter J (Electrical Engineering), it is required that motor controllers for auxiliaries vital to the propulsion equipment to be provided with what type of protection?	overload protection	low voltage protection	**low voltage release**	reverse current protection

ID #	Question	Choice A	Choice B	Choice C	Choice D
1948	Where is the power necessary to energize the howler "relay" coil at the engine room station as shown in the illustration?	**comes from each station's hand cranked generator**	is supplied from a battery or ship's power	is conducted through the relay's contacts	comes from pushing a button on the handset
1949	Whether analog or digital, what are most AC voltmeters calibrated to measure?	peak-to-peak voltage	**root-mean-square voltage**	average voltage	peak voltage only
1950	Which component will stop the motor shown in the illustration in case of a short-circuit fault overload in the control circuit?	disconnect switch fuses FU1, FU2, and FU3	**overload relay heaters and overload relay NC contacts (OL)**	transformer primary fuses FU4 and FU5	transformer secondary fuses FU6 and FU7
1951	Which device will stop the motor shown in the illustration in case of a short-circuit (high current) motor fault?	**disconnect switch fuses FU1, FU2, and FU3**	overload relay heaters and overload relay NC contacts (OL)	transformer primary fuses FU4 and FU5	transformer secondary fuses FU6 and FU7
1952	Which electrical schematic symbol represents a normally closed thermostat?	1	6	**8**	9
1953	Which electrical schematic symbol represents a normally open thermostat?	2	7	8	**9**
1954	Which electrical schematic symbol represents the device shown in figure "D"?	1	3	6	**8**
1955	Which figure represents the schematic symbol shown in figure "2"?	figure "A"	**figure "B"**	figure "C"	figure "D"
1956	Which line in figure "B" shown in the illustration represents the interval that the pulse has a positive voltage?	**3**	4	5	6
1957	Which line in figure "B" shown in the illustration represents the trailing edge of the wave?	3	**4**	5	6
1958	Which line of figure "B" shown in the illustration represents the interval that the pulse is has a negative voltage?	3	4	5	**6**
1959	Which material would have the lowest dielectric constant as used in a capacitor?	**air or vacuum**	mica	oil	paper
1960	Which of the AWG wire sizes listed below would have the smallest diameter?	0000	0	14	**20**
1961	Which of the conditions listed will indicate the need to clean the insulation on the windings of an electric motor?	**Higher than normal operating temperature.**	Excessive vibration at normal speed.	Sparking at the brushes.	High megger readings.
1962	Which of the diagrams shown in the illustration depicts the proper method of aligning brushes on a commutator for a DC machine?	A	B	**C**	D
1963	Which of the electrical properties listed will always be the same across each component in a parallel circuit?	Impedance	Current	Resistance	**Voltage**
1964	Which of the electrical schematic symbols represents a normally closed limit switch?	6	10	**11**	14

ID #	Question	Choice A	Choice B	Choice C	Choice D
1965	Which of the electrical schematic symbols represents a normally closed, held open limit switch?	11	12	**13**	14
1966	Which of the electrical schematic symbols represents a normally open limit switch?	5	7	**12**	13
1967	Which of the electrical schematic symbols represents a normally open, held closed limit switch?	11	12	13	**14**
1968	Which of the electrical schematic symbols represents the device shown in figure "A" of the illustration?	5	6	8	**11**
1969	Which of the electronic schematic symbols represents the capacitor illustrated in figure 1 of the illustration?	A	**B**	C	D
1970	Which of the electronic schematic symbols represents the capacitor illustrated in figure 2 of the illustration?	A	B	**C**	D
1971	Which of the electronic schematic symbols represents the capacitor illustrated in figure 3 of the illustration?	A	B	C	**D**
1972	Which of the electronic schematic symbols represents the capacitor illustrated in figure 4 of the illustration?	**A**	B	C	D
1973	Which of the figures shown in the illustration is a toroidal electromagnetic coil?	figure "A"	figure "B"	figure "C"	**figure "D"**
1974	Which of the figures shown in the illustration is an air choke coil?	**figure "A"**	figure "B"	figure "C"	figure "D"
1975	Which of the following actions can be carried out in order to prevent thermal runaway in a transistor?	Increase the current through the collector-base junction.	**Install a heat sink.**	Shift the "Q" point to increase collector current.	Increase the potential difference between the emitter and the base.
1976	Which of the following actions must be carried out before a voltage tester can be used to test the three line fuses to a three-phase motor?	The fuses must be removed from the circuit.	**The starter must be placed in the STOP position to stop and disconnect the motor.**	The three line connections in the motor terminal box must be disconnected and tagged.	Nothing need be done as long as the motor is running under a light load.
1977	Which of the following actions must be carried out prior to closing the alternator circuit breaker according to the graph "A" shown in the illustration?	Increase the alternator voltage.	**Decrease the alternator voltage.**	Increase the line voltage.	Decrease the line voltage.
1978	Which of the following activities occurs during the charging process of a lead-acid storage battery?	**The specific gravity of the acid increases.**	Both plates change chemically to lead sulfate.	Oxygen gas is absorbed.	Hydrogen gas is absorbed.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1979	Which of the following characteristics is most critical in determining the wire gauge size of the cable to be used in a particular circuit?	voltage rating	weight per unit length	**current rating**	inductance per unit length
1980	Which of the following components are used to convert alternating current produced in the DC generator armature windings to direct current?	Armature and equalizer	**Commutator and brushes**	Rotor and interpoles	Field and exciter
1981	Which of the following conditions indicates a short circuited capacitor when checking its condition with a digital multimeter set up as an ohmmeter?	The screen immediately displays 'OL' ohms, but gradually drops to 'zero' ohms.	**The screen immediately displays 'zero' ohms and remains at this value.**	The screen immediately displays 'OL' ohms and remains at this value.	The screen immediately displays 'zero' ohms, but gradually climbs to 'OL' ohms.
1982	Which of the following conditions indicates that a lead-acid battery is being charged too rapidly?	Sparks occurring at the positive terminal.	Unusually high electrolyte specific gravity.	Low plate potentials being developed.	**Excessively high temperatures and gassing rates.**
1983	Which of the following conditions will occur if the brake solenoid coil burns out on a cargo winch with an electrical brake?	**The brake will be set by spring force.**	The motor will overspeed and burn up.	The load suspended from the cargo boom will fall.	Nothing will happen; the winch will continue to operate as usual.
1984	Which of the following conditions would most likely lead to the failure of a resistor due to overheating?	Resistor wattage rating four times higher than that required for the circuit.	Resistor wattage rating two times higher than that required for the circuit.	Resistor wattage rating equal to that required for the circuit.	**Resistor wattage rating one half that required for the circuit.**
1985	Which of the following contactors or relays has a timing function for the transition from start to run?	KM1	KM2	KM3	**KA1**
1986	Which of the following devices are protected from being motorized by a reverse-power relay?	**Alternators**	Wave guides	Exciters	Amplidynes
1987	Which of the following electric meter movements uses a stationary permanent magnet and movable coil?	**D'Arsonval**	Electrodynamometer	Moving iron-vane	Inclined coil iron-vane
1988	Which of the following electrical schematic symbols represents a normally closed flow switch?	**6**	7	11	14
1989	Which of the following electrical schematic symbols represents a normally open flow switch?	6	**7**	12	13
1990	Which of the following electrical schematic symbols represents the device illustrated in figure "E"?	1	3	**6**	11
1991	Which of the following expresses the relationship of the AC input frequency and DC ripple output frequency in a full wave rectifier?	The output ripple frequency is the same as input frequency.	The output ripple frequency is one-half the input frequency.	**The output ripple frequency is twice the input frequency.**	The output ripple frequency is four times the input frequency.

ID #	Question	Choice A	Choice B	Choice C	Choice D
1992	Which of the following figures represents input sinking for a programmable logic controller?	A	**B**	C	D
1993	Which of the following figures represents input sourcing for a programmable logic controller?	**A**	B	C	D
1994	Which of the following figures represents output sinking for a programmable logic controller?	A	B	C	**D**
1995	Which of the following figures represents output sourcing for a programmable logic controller?	A	B	**C**	D
1996	Which of the following illustrated circuit schematics provides phase failure protection for a three phase motor using load side current sensing technology?	A	B	C	**D**
1997	Which of the following illustrated circuit schematics provides phase failure protection for a three phase motor using load side voltage sensing technology?	A	**B**	C	D
1998	Which of the following illustrated circuit schematics provides phase failure protection for a three phase motor using voltage sensing technology interfacing with a circuit breaker?	A	B	**C**	D
1999	Which of the following illustrated gauges is incapable of measuring vacuum depths at micron levels for verification of system dehydration while performing a system evacuation with a vacuum pump?	A	B	**C**	D
2000	Which of the following illustrated manual motor starters represents the wiring diagram illustrated in figure "A"?	**1**	2	3	4
2001	Which of the following illustrations represents the proper method of circuit grounding for a low level analog signal cable?	**A**	B	C	C
2002	Which of the following is a disadvantage of electric drive propulsion systems?	The propeller speed and direction of rotation are easily controllable.	**Propulsion motors are required along with electrical power generation machinery.**	Location of electric power generation machinery is flexible.	Main propulsion power may also be directed to ships electrical service distribution.
2003	Which of the following is a pictured control transformer, usually used to step down line voltage for supplying reduced voltage control circuits?	A	**B**	C	D
2004	Which of the following is a pictured current transformer, usually used for current measuring instrumentation and overcurrent protection circuits?	A	B	**C**	D

ID #	Question	Choice A	Choice B	Choice C	Choice D
2005	Which of the following is a pictured three phase power transformer, usually used to step down line voltage for supplying reduced voltage lighting circuits?	A	B	C	**D**
2006	Which of the following is true when comparing a primary cell type battery and secondary cell type storage battery?	**Primary cell type batteries are not rechargeable, whereas secondary cell type storage batteries are rechargeable.**	Secondary cell type storage batteries are not rechargeable, whereas primary cell type batteries are rechargeable.	Primary cell type batteries contain an electrolyte paste, whereas secondary cell storage batteries always contain acid.	Primary cell type batteries contain an electrolyte paste, whereas secondary cell storage batteries always contain alkali.
2007	Which of the following losses is minimized by laminating the core of a DC generator armature?	Winding copper loss	**Eddy current loss**	Magnetic hysteresis loss	IR drop loss
2008	Which of the following materials is a good electrical insulator?	**wood**	silver	copper	gold
2009	Which of the following materials is a good insulator?	steel	aluminum	**glass**	copper
2010	Which of the following materials is recommended for burnishing the slip rings of an alternator after grinding or turning?	grade 00 sandpaper	canvas wiper	**hardwood block**	smooth file
2011	Which of the following meters uses a shunt connected in series with the load, but parallel with the meter movement?	voltmeter	power factor meter	wattmeter	**ammeter**
2012	Which of the following methods should be used to dress the face of silver-plated contacts?	Filing with a mill file	Burnishing with a burnishing tool	**Sanding with 0000 sandpaper**	Knurling with a knurling tool
2013	Which of the following methods should be used to dress the face of silver-plated motor controller contacts?	Filing with a mill file	Grinding with grinding stone	**Sanding with 0000 sandpaper**	Burnishing with a burnishing tool
2014	Which of the following methods should be used to test for an 'open' stator winding coil in a wye-connected AC squirrel cage induction motor?	Test with an ohmmeter, with one test lead on the shaft, and the other test lead to each of the disconnected motor leads in succession and compare the resistances	**Test with an ohmmeter with the test leads across each pair disconnected motor lead leads in succession and compare resistances.**	Use a growler, listening for noise and vibration to diminish when over an open coil.	Use a growler, listening for noise and vibration to increase when over an open coil.
2015	Which of the following motors has a frame configuration for face mounting only?	A	B	**C**	D
2016	Which of the following motors has a frame configuration for face and base mounting?	A	B	C	**D**
2017	Which of the following motors has a frame configuration for resilient base mounting?	A	**B**	C	D

ID #	Question	Choice A	Choice B	Choice C	Choice D
2018	Which of the following motors has a frame configuration for solid base mounting only?	**A**	B	C	D
2019	Which of the following physical characteristics does a three-phase wound-rotor induction motor possess that a squirrel cage induction motor does not?	**Slip rings**	A commutator	A centrifugal switch	Compensating windings
2020	Which of the following pictures represents a magnetic contactor assembly?	A	**B**	C	D
2021	Which of the following pictures represents a magnetic non-reversing or single-speed motor starter?	**A**	B	C	D
2022	Which of the following pictures represents a magnetic reversing or two-speed motor starter?	A	B	C	**D**
2023	Which of the following pictures represents an overload relay assembly?	A	B	**C**	D
2024	Which of the following precautions should be taken when a blown fuse, rated at 10 amperes, is replaced?	Short out the fuse before removing it from the circuit.	Use needle-nose pliers to remove fuse from the circuit.	**Replace blown fuse with one of equal voltage and ampere capacity.**	Fuses of 10 ampere rating and less are virtually harmless when energized and may be handled freely.
2025	Which of the following precautions should be taken when troubleshooting various power circuits using a digital multimeter?	Never use this type of meter on circuits greater than 60 Hz as the meter may not register voltages over 60 Hz.	Always remember that the unit is polarity sensitive and if used on DC circuits reversing the leads may result in high temperatures within the tester.	Never connect the device to circuits where potentials greater than 120 volts may be present, as the internal electronics can only withstand small currents. .	**When in the manual ranging mode, always pre-set the meter to the next higher range than the amount of voltage expected in the circuit.**
2026	Which of the following precautions should be taken when troubleshooting various power circuits using an electronic solenoid type voltage tester?	Never use this tester on circuits of 60 Hz, as the tester may not register the voltage.	Always remember that the unit is polarity sensitive and if used on DC circuits reversing the leads may result in high temperatures within the tester.	Never connect the device to circuits where potentials are greater than 120 volts.	**Always verify that the power source frequency is compatible with the instrument before using it to troubleshoot electrical equipment.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2027	Which of the following precautions should be taken when troubleshooting various power circuits using an electronic voltage tester?	Never use this tester on circuits of 60 Hz, as the tester may not register the voltage.	Always remember that the unit is polarity sensitive and if used on DC circuits reversing the leads may result in high temperatures within the tester.	Never connect the device to circuits where potentials are greater than 120 volts.	**Always check a known power source of the same type and voltage before using it to troubleshoot electrical equipment.**
2028	Which of the following precautions should you take when securing propulsion generators and motors for an extended period of time?	Disconnect the brush pigtails from their contacts and circulate air through the units.	Disconnect the brush pigtails from their contacts and discharge carbon dioxide into the units to keep them dry.	**Lift the brushes from commutator collector rings and use the built-in heater to prevent moisture accumulation.**	Lift the brushes from commutator collector rings and circulate cool dry air through the units.
2029	Which of the following problems is indicated if a lead-acid battery begins to gas violently when it is first placed on charge?	Insufficient compartment ventilation is being provided.	A short circuit exists in one of the battery cells.	The battery is undergoing its normal charging rate.	**An excessive charging rate is being applied to the battery.**
2030	Which of the following problems will most likely occur if the starting winding of a split-phase induction motor failed to cutout once the motor approached operating speed?	The motor will eventually overspeed.	The motor will run at a reduced speed.	A time delay will stop the motor.	**The start winding will burn out.**
2031	Which of the following problems will occur if the circuit breaker of the incoming alternator is closed and it is 180° out of phase with the loaded alternator when paralleling?	The rotor of the loaded alternator will hunt.	**Severe cross currents will occur which could cause damage.**	The rotor of the incoming alternator will stop.	Both alternators will parallel 180° out of phase.
2032	Which of the following procedures represents the best method to prevent the freezing of batteries continuously exposed to low temperatures?	The battery caps should be removed.	The battery cap vents should be sealed.	**The battery should be kept in a fully charged condition.**	The battery should be disconnected from its charging source.
2033	Which of the following procedures should be used to maintain a large electric motor during periods of inactivity?	A thin layer of air-drying varnish should be applied on the windings.	Compressed air should be blown over areas where dust is deposited.	Spraying a solvent periodically to remove carbon dust.	**Space heaters should be used to prevent condensation of moisture.**
2034	Which of the following represents a characteristic of an ungrounded electrical distribution system?	**Accidental contact between one line and ground does not cause an outage.**	Double ground faults on different phases will not cause an outage.	Ground detection systems are unnecessary.	Accidental contact between one line and ground will always cause an outage.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2035	Which of the following represents the accepted method of cleaning dust and foreign particles from electrical equipment while limiting damage to electric components?	Carefully using a soft copper bristle brush.	Blowing a high velocity stream of compressed air rapidly across the components.	**Using a vacuum cleaner to remove debris from the components.**	Using carbon tetrachloride as a cleaning solvent to clean the components.
2036	Which of the following should be the FIRST step in removing a generator from parallel operation when no longer needed?	Trip the off-going generator off-line by opening its circuit breaker.	Shut down the prime mover driving the off-going generator.	**Decrease the governor setting on the 'off going' generator while simultaneously increasing the governor setting on the generator to remain on line.**	Decrease the cycles of the generator staying on the line while simultaneously increasing the cycles of the 'off going' generator.
2037	Which of the following statement is TRUE concerning Azipod propulsion systems?	The pod assembly swivels on a horizontal axis.	**The system integrates propulsion and steering into one function.**	The system requires the need for a separate rudder.	The system requires the use of a controllable pitch propeller.
2038	Which of the following statements about a three-phase wye connected alternator is correct?	The line current is 1.73 times the phase current.	The phase current is 1.73 times the line current.	**The line voltage is 1.73 times the phase voltage.**	The phase voltage is 1.73 times the line voltage.
2039	Which of the following statements about copper wire sized by the AWG rating system is correct?	Number 12 AWG wire has a higher current rating than number 10 AWG wire.	Number 12 AWG wire has a higher dielectric strength than number 10 AWG wire.	Number 12 AWG wire is larger than Number 10 AWG wire.	**Number 12 AWG wire at 25°C has more resistance per 1000 feet than No. 10 AWG wire at 25°C.**
2040	Which of the following statements concerning a circuit with parallel connected resistors is correct?	**The voltage drop across each resistor is the same.**	The total current flow equals the reciprocal of the sum of the individual currents.	The total resistance equals the sum of the individual resistances.	The total voltage equals the sum of the individual voltages across each resistance.
2041	Which of the following statements concerning a wet cell Nickel-Cadmium battery is true?	When mixing the electrolyte always add acid to the water.	When mixing the electrolyte always add water to the acid.	**Nickel-Cadmium batteries should be charged with a voltage of approximately 1.85 volts per cell**	The electrolyte of an idle Nickel-Cadmium battery must be replaced monthly to maintain battery condition.
2042	Which of the following statements concerning AC circuits is correct?	The power factor of a resistive circuit is always zero.	True power in an inductive circuit always equals apparent power.	**Inductive reactance varies directly with the source frequency.**	The current lags the voltage in a capacitive circuit.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2043	Which of the following statements concerning analog and digital devices are correct?	**The variables in digital systems are fixed quantities, and the variables in analog systems are continuous quantities.**	There are no basic differences between the two systems.	Analog devices are superior in accuracy compared to digital devices.	Operations in a digital device are performed simultaneously.
2044	Which of the following statements concerning copper wire sized by AWG numbers is correct?	Number 12 AWG wire has a higher current rating (ampacity) than 10 AWG wire.	**Number 12 AWG wire at 25°C has more resistance per 1000 ft than 10 AWG wire at 25°C.**	Number 12 AWG wire has a larger diameter than 10 AWG wire.	Number 12 AWG wire is larger cross-sectional area than 10 AWG wire.
2045	Which of the following statements concerning electrical cables is correct?	**Where they pass through watertight bulkheads, they should be fitted with watertight stuffing boxes.**	Electric cable coverings should never be grounded.	Electrical cables must be rigidly held in place by welding of armored cable.	Electrical cables must be glued in place where nonmetallic insulation is used.
2046	Which of the following statements concerning figure "6" of the illustration is true?	The symbol represents a computer cable pin plug.	**The symbol represents a switch using maintained contact with "either/or" logic.**	The symbol represents a switch which functions with analog parameters.	The symbol represents an overload relay.
2047	Which of the following statements concerning nickel-cadmium batteries is true?	**The state of charge cannot be determined by the specific gravity values.**	Nickel-cadmium batteries should only be discharged 50% before recharging.	The electrolyte of an idle nickel-cadmium battery must be replaced monthly to maintain battery condition.	When mixing electrolyte always add acid to the water.
2048	Which of the following statements concerning Nickel-Cadmium batteries is true?	When mixing the electrolyte always add acid to the water.	When mixing the electrolyte always add water to the acid.	**Nickel-Cadmium batteries can be stored for a long period of time while still keeping a full charge.**	The electrolyte of an idle Nickel-Cadmium battery must be replaced monthly to maintain battery condition.
2049	Which of the following statements concerning Nickel-Cadmium batteries is true?	When mixing Ni-Cad electrolyte always add acid to the water.	When mixing Ni-Cad electrolyte always add water to the acid.	**Nickel-Cadmium batteries can be stored for a long period of time while still keeping a full charge.**	The electrolyte of an idle Nickel-Cadmium battery must be replaced monthly to maintain battery condition.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2050	Which of the following statements concerning the maintenance of solid-silver contacts in relays and auxiliary control circuits is correct?	When necessary, they should always be dressed with a wire wheel.	**They should be filed with a fine-cut file when projections extend beyond the contact surface.**	When black silver oxide is present, it should always be removed from the contact surface with coarse sandpaper.	When necessary, they should be spray painted with electrical shellac
2051	Which of the following statements concerning the specific gravity of a battery electrolyte is true?	The electrolyte becomes less dense when it is cooled.	**The specific gravity reading is lowered when the electrolyte temperature has increased.**	The most accurate hydrometer reading is obtained immediately after water is added.	The temperature does not affect the specific gravity of the electrolyte.
2052	Which of the following statements correctly applies to bipolar junction transistors?	LED and LCD are the two basic types of transistors.	**The three terminals are called the emitter, base, and collector.**	The emitter separates the base and collector.	The collector separates the emitter and base.
2053	Which of the following statements describes the difference between the primary windings and the secondary windings of a 2:1 stepdown voltage transformer?	The secondary windings have twice as much resistance as the primary windings.	The secondary windings use smaller wires than the primary windings.	The secondary windings can only provide half as much current as the primary windings.	**The secondary windings have half as many turns as the primary windings.**
2054	Which of the following statements describes the effects of ambient temperature on local action within lead-acid storage batteries?	**Increasing ambient temperature increases local action.**	Increasing ambient temperature decreases local action.	Ambient temperature has no effect on local action.	At 90°F all local action virtually ceases.
2055	Which of the following statements describes the significance of ambient temperature in relation to the service life of electronic components?	Ambient temperature should be as high as possible to drive off moisture.	**Increased ambient temperature decreases the service life of electronic components.**	Ambient temperature is not significant as long as the relative humidity is kept low.	A reduced ambient temperature causes a corresponding reduced service life.
2056	Which of the following statements describes what will happen when both the polarity of the field poles, and the direction of current to the brushes of a DC motor are reversed?	The motor will not start.	The direction of rotation of the armature will be reversed.	**The direction of rotation of the armature will remain the same.**	The field pole windings will become overheated.
2057	Which of the following statements describes what will occur if the motor torque-speed and current-speed curves shown in the illustration is required to carry 150% of full load?	The torque will decrease.	**The stator current will increase.**	The slip will decrease.	The slip value, stator current curve, and torque curve will all coincide.
2058	Which of the following statements is correct for the illustrated circuit in figure "B"?	**'R1', 'R2', and 'R3' are connected in series.**	'R1', 'R2', and 'R3' are connected in parallel.	The voltages measured across 'R1', 'R2', and 'R3' are equal.	The total resistance equals 1/R1 + 1/R2 + 1/R3.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2059	Which of the following statements is correct regarding the use of an analog or digital multimeter when directly measuring current?	**It must be connected in series with the load of the circuit.**	You should always start with the lowest range until a suitable reading is obtained.	It must be connected in parallel with the load of the circuit.	An external shunt is generally utilized where current is less than 10 amperes.
2060	Which of the following statements is true concerning a large polyphase synchronous main propulsion motor as used in an electric propulsion drive system?	**The motor is started as an induction motor.**	Resistance is gradually added to the rotor circuit.	The starting current is held below the rated current.	The field winding is energized for starting purposes only.
2061	Which of the following statements is true concerning a stepdown transformer in an operating AC power circuit?	Secondary voltage and current will both be increased.	Secondary voltage and current will both be decreased.	**Secondary voltage is decreased and current is increased.**	Secondary voltage is increased and current is decreased.
2062	Which of the following statements is true concerning all rotating-field three-phase alternators?	**Each has three separate but identical, interconnected stator windings (one for each phase) acted on by one system of rotating magnets.**	Each has one stator winding acted on by three separate but identical, interconnected systems of rotating magnets (one for each phase).	Each has one stator winding acted on by one system of rotating magnets.	Each has three separate but identical, interconnected stator windings (one for each phase) acted on by three separate but identical, interconnected systems of rotating magnets (one for each phase).
2063	Which of the following statements is true concerning circuits with parallel connected resistances?	**The total current flow equals the sum of the individual currents.**	The total current flow equals the reciprocal of the sum of the individual currents.	The total resistance equals the sum of the individual resistance.	The total voltage equals the sum of the individual voltages across each resistance.
2064	Which of the following statements is true concerning stepdown transformer operation?	The current drawn by the primary side is greater than the current delivered from the secondary side.	The voltage supplied to the primary side is lower than the voltage produced by the secondary side.	The kVA consumed by the primary side is greater than the kVA produced by the secondary side.	**The voltage supplied to the primary side is greater than the voltage produced by the secondary side.**
2065	Which of the following statements is true concerning the cleaning of electrical contacts?	Compressed air should be used to blow out metallic dust.	Magnetic brushes should be used to remove metallic dust.	The contact surfaces should be greased to increase contact resistance.	**Delicate parts should be cleaned with a brush and an approved safety solvent.**
2066	Which of the following statements is true concerning the conditions depicted in graph "A" of the illustration?	The alternator voltage is equal to the line voltage.	The alternator frequency is higher than the line frequency.	**The alternator frequency is lower than the line frequency.**	The alternator frequency is equal to the line frequency.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2067	Which of the following statements is true concerning the conditions depicted in graph "A" of the illustration?	The line frequency is greater than the alternator frequency.	The line voltage is greater than the alternator voltage.	**The line frequency is less than the alternator frequency.**	The line frequency is equal to the alternator frequency.
2068	Which of the following statements is true concerning the following illustration?	Maximum voltage is produced in figures A and C	The figures represent a basic AC generator	**The figures represent a basic DC generator**	Field polarity reverses from figures A to B and C to D
2069	Which of the following statements is true concerning the manual motor starter diagram shown in figure "A" of the illustration?	The motor has two-leg protection by thermal overloads.	**The motor has three-leg protection by thermal overloads.**	The motor has two-leg protection by magnetic overloads.	The motor has three-leg protection by magnetic overloads.
2070	Which of the following statements is true concerning the motor controller circuit shown in the illustration?	**The controller is configured for across-the-line (direct-on-line) starting.**	The controller is configured for reduced voltage starting.	The controller is configured for use with a single phase induction motor.	The control circuit operates at full line voltage.
2071	Which of the following statements is true concerning the motor controller circuit shown in the illustration?	The controller is configured for reduced voltage starting.	The controller is configured for use with a three phase reversible squirrel-cage induction motor.	**The controller is configured for use with a three phase non-reversible squirrel-cage induction motor.**	The controller is configured for low voltage release. .
2072	Which of the following statements is true concerning the operating characteristics of a basic squirrel-cage induction motor?	**Rotor slip is dependent upon the motor load.**	An increase in motor load results in less slip.	A decrease in rotor speed results in less current draw.	A decrease in rotor speed produces a weaker magnetic field.
2073	Which of the following statements is true concerning the operation of modern marine electric drive DC propulsion motors?	The rotor follows the frequency and phase sequence rotation of voltage applied to the motor until it reaches the desired speed.	**The silicon-controlled rectifiers in the power converter are used to control the voltage and current applied to the motor armature.**	The source and load converters respond to a small reference voltage increasing the frequency applied to the motor until it reaches the desired speed.	The cycloconverter is used to increase the voltage applied to the motor until it reaches the desired speed.
2074	Which of the following statements is true concerning the operation of two alternators in parallel?	**The cycles per second of each alternator are the same.**	Both alternator governors must be set with the same amount of speed droop.	The number of field poles must be the same on each alternator.	The load must always be divided equally between alternators.
2075	Which of the following statements is true if a 100 watt lamp and a 75 watt lamp each rated at 100 volts are connected in parallel across a 100 volt power supply?	The 75 watt lamp will draw as much current as the 100 watt lamp.	The 100 watt lamp will have a greater resistance.	Current flow will be the same across each lamp.	**The 75 watt lamp will have a higher resistance.**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2076	Which of the following statements regarding the use of an analog or digital multimeter set up as an milliammeter is correct?	**It must be connected in series with the load of the circuit.**	You should always start with the lowest range until a suitable reading is obtained.	It must be connected in parallel with the load of the circuit.	An external shunt is generally utilized where current is less than 10 amperes.
2077	Which of the following statements represents an application of a silicon controlled rectifier?	**Provides DC power for a main propulsion motor.**	Used as a voltage reference diode.	Used in photo cell sensor circuits for boiler burners.	Used to eliminate AC power supply hum.
2078	Which of the following statements represents the correct method of connecting the shunt of an ammeter prior to taking a reading?	In series with the load and in series with the meter movement.	**In series with the load and in parallel with the meter movement.**	In parallel with the load and in series with the meter movement.	In parallel with the load and in parallel with the meter movement.
2079	Which of the following statements represents the FIRST precaution to be taken prior to working on any installed electrical component?	Wear rubber gloves and boots.	Use only approved non-conducting tools.	Ground the case of the machine before beginning any repairs.	**Open the supply circuits and tag the switches.**
2080	Which of the following statements represents the FIRST step in seating new brushes on slip rings?	**Lay sandpaper between the brush and the slip ring and slide the sandpaper back and forth under the brush.**	Press the brushes against the slip ring with a wood block.	Increase brush pressure and run at no load for 3 to 4 hours.	Apply seating compound under the brushes and run at no load for 2 hours.
2081	Which of the following statements represents the important factor that must be considered when replacing a faulty diode in a generators excitation field rectifier assembly?	**Be certain that the replacement diode is installed with the same polarity as the one removed.**	Never alter the diode alignment to cause a change in the neutral plane.	Replacement of a diode also requires balancing of the rotor with a one-piece rotor lamination to be shrunk fit and keyed to the shaft.	The replacement diode must be dipped in varnish prior to installation to protect against humidity.
2082	Which of the following statements represents the main difference between a relay and a contactor?	Contactors control current and relays control voltage.	A relay is series connected and a contactor is parallel connected.	**Contactors contacts can handle heavier loads than relay contacts. .**	Contactors are made from silver and relays are made from copper.
2083	Which of the following statements represents the reading display of a hand-cranked megohmmeter when testing a capacitor start motor start capacitor in good condition that has been properly discharged prior to the test?	The needle should immediately deflect to infinity and remain there while cranking	**The needle should immediately deflect to a very low resistance value and then gradually increase to infinity while cranking.**	The needle should immediately deflect to infinity and then continuously drop until a very low resistance value is indicated while cranking.	The needle should immediately deflect to a very low resistance value and remain there while cranking.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2084	Which of the following statements, concerning the cleaning maintenance of a brushless generator, is correct?	Cleaning of windings should be performed on a periodic basis regardless of the state of cleanliness.	Hot soapy water should be used to remove dust and grime from windings.	High pressure air should be used to blow out dust and grime from the windings.	**Cleaning of windings should be performed on a conditional basis using a vacuum or using a clean, dry, lint-free rag.**
2085	Which of the following types of DC motors has its field connected in parallel with its armature?	Universal	**Shunt wound**	Salient pole	Series wound
2086	Which of the following types of DC motors is considered to produce the highest starting torque?	**series wound**	shunt wound	cumulative-compound wound	differential-compound wound
2087	Which of the following types of motors can be used for correcting power factor during normal operation?	Squirrel-cage induction	Wound-rotor induction	Permanent magnet	**Polyphase Synchronous**
2088	Which of the following would best describe a standard electric meter movement that uses the principles of electromagnetism to measure current?	**moving coil meter movement**	hot-wire movement	rectifier movement	digital movement
2089	Which of the formulas listed is correct for determining power?	**P = (E)(E)/R**	P = (I)(R)(R)	P = (I)(I)/R	P = E/R
2090	Which of the illustrated devices is used to charge in precise amounts of refrigerant and features a graduated cylinder calibrated in weight units, but cannot be used to weigh a refrigerant bottle?	**A**	B	C	D
2091	Which of the illustrated devices would be suitable for recovering refrigerant from a large chiller without processing it or testing in any way and which has integral refrigerant storage capacity?	**A**	B	C	D
2092	Which of the illustrated devices would be suitable for recovering refrigerant without processing it or testing in any way and which requires connection to an external recovery cylinder?	A	B	C	**D**
2093	Which of the illustrated devices would be suitable for removing refrigerant quickly from a low pressure system as a liquid only without processing the refrigerant in any way, requiring follow-up vapor recovery with another device?	A	B	**C**	D
2094	Which of the illustrated devices would be the LEAST accurate for the purposes of weighing-in a refrigerant charge?	A	B	**C**	D

ID #	Question	Choice A	Choice B	Choice C	Choice D
2095	Which of the illustrated electrical meters is a general purpose volt-ohm-milliammeter and features an analog display?	**A**	E	G	I
2096	Which of the illustrated electrical meters is a general purpose volt-ohm-millimeter with many additional built-in special purpose functions and features a digital display?	**B**	C	D	F
2097	Which of the illustrated electrical meters is a powerful, versatile diagnostic tool which features a digital display, but is also capable of displaying waveforms?	B	C	D	**F**
2098	Which of the illustrated electrical meters is best suited for determining the presence of voltage for safety purposes and features a lighted window?	B	C	F	**I**
2099	Which of the illustrated electrical meters is best suited for determining three phase power phase sequence, is battery powered, and features a display with LEDs?	B	C	D	**H**
2100	Which of the illustrated electrical meters is specifically designed to measure insulation resistance, is battery powered, and features a digital display?	B	**C**	D	F
2101	Which of the illustrated electrical meters is specifically designed to measure relatively heavy AC currents by clamping action, but can also measures AC volts and resistance and features an analog display?	A	**E**	G	I
2102	Which of the illustrated electrical meters is specifically designed to measure relatively heavy currents by clamping action and features a digital display capable of holding maximum and minimum values?	B	C	**D**	F
2103	Which of the illustrated figures uses an LC capacitor-input filter?	A	B	C	**D**
2104	Which of the illustrated figures uses an LC choke-input filter?	A	**B**	C	D
2105	Which of the illustrated gauges is capable of measures vacuums at the micron level for the purpose of proving system dehydration during system evacuation with a vacuum pump, but displays the achieved vacuums at incremental threshold intervals rather than continuously.	A	**B**	C	D
2106	Which of the illustrated motors has a totally enclosed motor enclosure?	A	B	C	**D**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2107	Which of the illustrated motors has a totally enclosed, fan-cooled (TEFC) motor enclosure?	**A**	B	C	D
2108	Which of the illustrated motors has an open motor enclosure?	A	**B**	C	D
2109	Which of the illustrated motors has an open, drip-proof (ODP) motor enclosure?	A	B	**C**	D
2110	Which of the illustrated resistors represents the schematic symbol shown in figure "A"?	**figure "4"**	figure "8"	figure "9"	figure "10"
2111	Which of the illustrated resistors represents the schematic symbol shown in figure "B"?	figure "4"	figure "6"	**figure "10"**	figure "11"
2112	Which of the illustrated resistors represents the schematic symbol shown in figure "C"?	figure "4"	**figure "6"**	figure "7"	figure "10"
2113	Which of the illustrated resistors represents the schematic symbol shown in figure "D"?	figure "5"	figure "6"	**figure "7"**	figure "10"
2114	Which of the illustrated resistors represents the schematic symbol shown in figure "F"?	figure "5"	figure "6"	figure "10"	**figure "11"**
2115	Which of the illustrated safety disconnect switches represents a double throw switch?	A and B	**B and D**	C and D	A and D
2116	Which of the illustrated schematic symbols represents the type of switch pictured in figure "C" of the illustration?	**4**	5	6	7
2117	Which of the illustrated schematic symbols represents the type of switch pictured in figure "F" of the illustration?	1	2	**3**	6
2118	Which of the illustrated valves is a conventional service valve with front and rear seats?	**A**	B	C	D
2119	Which of the illustrated valves is used to gain access to a hermetic system and features a Schrader core valve which is unseated by the core depressor of hose fitting when attached?	A	B	C	**D**
2120	Which of the illustrated valves is used to gain access to a hermetic system not fitted with service valves or access fittings by means of piercing the refrigeration system tubing?	A	B	**C**	D
2121	Which of the instruments listed could be use to locate a grounded field coil in a synchronous motor onboard ship?	Ammeter	Voltmeter	**Megohmmeter**	Frequency meter
2122	Which of the instruments listed is generally connected in series with the load in the circuit?	**Ammeter**	Megohmmeter	Wattmeter	Voltmeter
2123	Which of the instruments listed is used to check insulation resistance?	Magneto	**Megohmmeter**	Dynamometer	Rheostat
2124	Which of the listed battery charging circuits is used to maintain a wet-cell, lead-acid, storage battery in a fully charged state during long periods of disuse?	Normal charging circuit	Quick charging circuit	**Trickle charging circuit**	High ampere charging circuit

ID #	Question	Choice A	Choice B	Choice C	Choice D
2125	Which of the listed classes of electrical insulation is suited for the highest operating temperature?	Class 90 (O)	Class 105 (A)	Class 130 (B)	**Class 180 (H)**
2126	Which of the listed colors properly describes a DC motor commutator when correct commutation is taking place?	Shiny blue	Burnished green	Brick red	**Chocolate brown**
2127	Which of the listed conditions could cause a recently overhauled DC motor to have excessively hot windings and sparking at the brushes?	**Reversed interpole polarity**	Low series field current	High shunt field current	Excessive humidity
2128	Which of the listed conditions could indicate the need for cleaning electrical insulation?	Low ambient temperature	Low operating temperature	High dielectric strength	**Low megger readings**
2129	Which of the listed conditions describes the effect on intrinsic semiconductor operation as a result of a temperature increase?	Capacitive reactance will decrease	**Conductivity will increase**	Inductive reactance will decrease	Resistivity will increase
2130	Which of the listed conditions might contribute to very rapid wearing of a DC machine's commutator bars?	A grounded commutator bar	**Using improper grade of carbon brushes**	Aligning the front and rear mica V-rings improperly	An open circuit in the armature
2131	Which of the listed conditions occur when '4th point lower' is selected on the winch hoist controller shown in the illustration?	Master switch contacts "3", "4", "5, "6", and "7" close.	**Contactors 'L', '1A', '2A' and '3A' pull in.**	Master switch contacts "3", "5", "6", "7", and "8" close.	Contactors 'H', '1A', '2A', and' 3A' drop out.
2132	Which of the listed conditions occur when selection is made for 'third point hoist' on the winch hoist controller shown in the illustration?	Master switch contacts "4","7", and "8" close.	Contactors 'H, '3A', '4A' pick up.	Contactors 'H', '1A' and '2A' drop out.	**Master switch contacts "4","5", and "6" close.**
2133	Which of the listed conditions will occur if dirt and grease are allowed to accumulate between the commutator segments of a DC motor?	**A partial short circuit.**	A dead short circuit.	Misalignment of the motor shaft.	Overspeeding of the motor.
2134	Which of the listed conditions will occur if the polarity of the field poles and the direction of current to the brushes of a DC motor were both reversed?	The motor would not start.	The direction of rotation of the armature would be reversed.	**The direction of rotation of the armature would be unchanged.**	The field pole windings would become overheated.
2135	Which of the listed devices is an electrical device which employs a stationary armature and a rotating electromagnetic field that is commonly used aboard ship?	magnetic amplifier	**ship's service alternator**	three-wire DC generator	saturable core reactor
2136	Which of the listed devices is most likely to be installed on a large modern diesel-electric alternating current propulsion generator for commercial ship propulsion for the purposes of fire suppression?	A Halon fire extinguishing system.	**A CO2 fire extinguishing system.**	A foam fire extinguishing system.	A dry chemical fire extinguishing system.
2137	Which of the listed devices is used to sense a physical input quantity (such as pressure) and convert it to a corresponding electrical voltage signal?	**Transducer**	Reducer	Transformer	Rectifier

ID #	Question	Choice A	Choice B	Choice C	Choice D
2138	Which of the listed devices may be used as a digital device?	variable resistor	**diode**	variable choke	thermistor
2139	Which of the listed faults can only be eliminated by turning or grinding the face of a commutator with a rigidly supported tool?	Sparking brushes	**Eccentricity**	High mica	Incorrect brush angle
2140	Which of the listed figures in the illustration represents a transformer configured for dual voltage primary and a dual voltage secondary?	A	D	E	**F**
2141	Which of the listed figures in the illustration represents a transformer configured for single voltage primary and a dual voltage secondary?	A	D	**E**	F
2142	Which of the listed figures in the illustration represents a transformer configured for single voltage primary and a single voltage secondary?	**A**	D	E	F
2143	Which of the listed figures in the illustration represents a transformer configured for single voltage primary and a tapped secondary?	A	**D**	E	F
2144	Which of the listed figures shown in the illustration represents a three phase transformer connected in a delta-delta configuration?	**1**	2	3	4
2145	Which of the listed figures shown in the illustration represents a three phase transformer connected in a delta-wye configuration?	1	2	**3**	4
2146	Which of the listed figures shown in the illustration represents a three phase transformer connected in a wye-delta configuration?	1	2	3	**4**
2147	Which of the listed figures shown in the illustration represents a three phase transformer connected in a wye-wye configuration?	1	**2**	3	4
2148	Which of the listed forms of water should be added to a lead-acid battery?	saltwater	brackish water	**distilled water**	any water available
2149	Which of the listed instruments can be best used to locate a grounded field coil in a synchronous motor onboard ship?	Frequency meter	**Megohmmeter**	Voltmeter	Multimeter
2150	Which of the listed items will stop a motor due to a reduction in voltage and automatically restart it when the voltage is restored to normal?	Low voltage protection circuit	Non-renewable link fuse	Renewable link fuse	**Low voltage release circuit**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2151	Which of the listed logic gates are considered to be the BASIC building blocks (basic logic gates) used in logic diagrams, assuming that the OR, NOR, AND, NAND, and NOT logic gates are required?	NOR, NAND, and NOT	**OR, AND, and NOT**	OR and AND only	NOR and NAND only
2152	Which of the listed meters uses a shunt connected in series with the load, but parallel with the meter movement?	Voltmeter	Power factor meter	**Ammeter**	Wattmeter
2153	Which of the listed motors will operate at the highest RPM, assuming that each operates at the same frequency?	**A four-pole synchronous motor under normal load.**	A four-pole induction motor under no load.	A six-pole synchronous motor under normal load.	A six-pole induction motor under full load.
2154	Which of the listed pairs of materials make the best insulators?	copper and aluminum	**glass and mica**	dry air and a vacuum	doped silicon and germanium
2155	Which of the listed pairs of materials make the best insulators?	dry air and a vacuum	salt water and moist earth	doped silicon and germanium	**paper and mica**
2156	Which of the listed precautions should be observed prior to cleaning the insulation of an electric motor?	Slow the motor down to low speed.	**Disconnect the motor from the power source.**	Secure all ventilation in the area.	Preheat the insulation to assist in cleaning.
2157	Which of the listed procedures is the best way to tell if a motor has become overloaded?	**Measure the current flow and compare it with the motor full load current flow as shown on the nameplate.**	Feel the motor and judge by the temperature.	Watch for telltale signs of smoke coming from the motor.	Periodic opening of the O/L relay coil
2158	Which of the listed procedures should be carried out to prevent moisture damage to electrical apparatus during extended periods of idleness?	Fill the motor housing with CO2 to inert the space.	Strap silica gel around the commutator.	**Place heat lamps in the motor housings.**	Cover the equipment with a canvas tarpaulin.
2159	Which of the listed ranges represents the specific gravity for the electrolyte of a fully charged lead-acid battery at room temperature?	1.100 to 1.150	1.180 to 1.200	**1.270 to 1.285**	1.750 to 2.000
2160	Which of the listed sections of an emergency switchboard is used to supply power for alarm signals under emergency conditions?	The generator and bus transfer section	The 450 volt, 60 cycle, 3 phase bus	The 120 volt, 60 cycle, 3 phase bus	**The 24 volt DC bus**
2161	Which of the listed statements is correct when using an digital multimeter set up as an ohmmeter?	With the test leads shorted together, a reading of 'OL' ohms will be displayed.	**With the test leads shorted together, a reading of 'zero' ohms will be displayed.**	With the test leads apart insulated from each other, a reading of 'zero' ohms will be displayed.	It is usually not possible for a digital multimeter to be set up as an ohmmeter.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2162	Which of the listed temperature measuring devices installed on a large turbo-electric alternating current propulsion generator would be the most reliable for monitoring generator temperatures to avoid premature winding insulation failure?	**Temperature sensors inserted in the stator slots for measuring stator winding temperature.**	Temperature sensors measuring the temperature of the cooling air associated with the generator air cooler	Temperature sensors measuring the temperature of the cooling water associated with the generator air cooler	Current transformers are the most reliable means of monitoring generator temperatures
2163	Which of the listed transformers uses a single winding to produce voltage transformation?	Step-up transformers	Step-down transformers	**Autotransformers**	Isolation transformers
2164	Which of the listed types of lighting fixtures does the diagram shown in figure "A" of the illustration represent?	High pressure sodium	Low voltage quartz	**Low pressure mercury fluorescent**	High pressure mercury fluorescent
2165	Which of the listed types of motor controllers and starters is illustrated?	Across-the-line	Primary-resistor	**Autotransformer**	Part-winding
2166	Which of the meters listed should only be used after a circuit has been electrically de-energized?	Wattmeter	Frequency meter	Ammeter	**Ohmmeter**
2167	Which of the methods listed below is used to provide the rotational torque to cause an AC generator to turn?	Residual magnetism remaining in the field.	Providing current to the field from an external source.	Residual magnetism remaining in the armature.	**Starting of the prime mover.**
2168	Which of the methods listed is used to maintain equal load sharing between two compound wound DC generators operating in parallel?	The shunt fields are interconnected.	The shunt field rheostats are interconnected.	The series fields of both generators are connected in series.	**The series fields of both generators are connected in parallel.**
2169	Which of the methods listed is used to maintain the division of load between two compound-wound, DC generators operating in parallel?	The shunt fields are interconnected.	The shunt field rheostats are interconnected.	The series fields of both generators are connected in series.	**The equalizer connection parallels the series fields of all machines.**
2170	Which of the motors for the devices listed below is fitted with an instantaneous overload relay?	Fan	Pump	**Winch**	Machine tool
2171	Which of the pictured motors is a C-frame shaded pole motor used to drive very small electrical loads and is non-reversible.	**A**	B	C	D
2172	Which of the pictured motors is a square core shaded pole motor used to drive very small electrical loads and is non-reversible.	A	**B**	C	D
2173	Which of the pictured motors is a stepper motor used to translate rotational position such as in a compass repeater.	A	B	C	**D**
2174	Which of the pictured motors is a synchronous motor used to drive very small electrical motors such as timers.	A	B	**C**	D

ID #	Question	Choice A	Choice B	Choice C	Choice D
2175	Which of the pictured motors within the split phase family of single phase induction motors represents a capacitor start, induction run motor?	**A**	B	C	D
2176	Which of the pictured motors within the split phase family of single phase induction motors represents a permanent split capacitor motor?	A	**B**	C	D
2177	Which of the pictured motors within the split phase family of single phase induction motors represents a split phase, resistive start, induction run motor?	A	B	**C**	D
2178	Which of the pictured solid state electronic semiconductor devices in the illustration is a silicon-controlled rectifier?	1	2	**4**	7
2179	Which of the pictured solid state electronic semiconductor devices is a bipolar junction transistor (BJT)?	1	3	4	**6**
2180	Which of the pictured solid state electronic semiconductor devices is a rectifier diode?	**1**	3	4	6
2181	Which of the pictured solid state electronic semiconductor devices is an integrated circuit (IC) chip?	3	4	**5**	6
2182	Which of the pictured solid state semiconductor devices is a light-emitting diode?	1	2	4	**7**
2183	Which of the pictured solid-state semiconductor devices in the illustration is a rectifier bridge?	2	**3**	4	5
2184	Which of the problems listed will occur if a lead-acid battery is allowed to remain in a discharged condition for a long period of time?	**The battery may be unable to accept a full charge.**	The electrolyte will change to lead sulfate.	The concentrated sulfuric acid will attack the lead peroxide plates.	The separators will harden.
2185	Which of the procedures or conditions listed could result in damaging a transistor beyond repair?	**Providing incorrect polarity to the collector circuit.**	Providing insufficient voltage to the input circuit.	Applying silicone grease between the heat sink and the transistor mounting.	Installing a transistor whose current rating exceeds the design circuit current.
2186	Which of the processes listed occurs during the charging of a lead-acid storage battery?	Both plates change to sponge lead.	**Lead sulfate is changed to lead peroxide in the positive plates and sponge lead in the negative plates respectively.**	Both plates change to lead peroxide.	Lead peroxide in the positive plates and sponge lead in the negative plates change to lead sulfate.
2187	Which of the referenced wave shapes would appear across test points 1 and 2 (TP1 and TP2) referring to the circuit shown in the illustration?	E	F	H	**I**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2188	Which of the referenced wave shapes would appear at point test point 3 (TP3) with respect to ground referring to the circuit shown in the illustration?	E	**F**	G	H
2189	Which of the referenced wave shapes would appear at test point 4 (TP4) with respect to ground referring to the circuit shown in the illustration?	E	F	G	**H**
2190	Which of the referenced wave shapes would appear at test point 5 (TP5) with respect to ground referring to the circuit shown in the illustration?	E	F	**G**	H
2191	Which of the schematic symbols shown in the illustration represents a normally closed float level switch?	1	**3**	4	6
2192	Which of the schematic symbols shown in the illustration represents a normally open float level switch?	2	3	**4**	7
2193	Which of the schematic symbols shown in the illustration represents the device shown in figure "F" of the illustration?	1	**3**	6	8
2194	Which of the substances listed can be used to shield sensitive equipment from static magnetic fields?	Glass	Mica	Bakelite	**Permeable iron**
2195	Which of the substances listed should be applied to battery terminals to help prevent corrosion?	Zinc chromate	Lead hydroxide	Lead peroxide	**Petroleum jelly**
2196	Which of the terms listed best describes a compound-wound DC generator having a higher voltage at no load than at full load?	Flat compounded	Over compounded	**Under compounded**	Terminal compounded
2197	Which of the wave shapes shown in the illustration is termed a ramp or saw tooth wave?	A	B	**C**	E
2198	Which of the wave shapes shown in the illustration is termed a sinusoidal wave?	**A**	B	C	D
2199	Which of the wave shapes shown in the illustration is termed a square wave?	A	**B**	C	D
2200	Which section of the circuit is responsible for maintaining a nearly constant voltage for all loads within its operating range?	A	B	C	**D**
2201	Which section of the circuit shown in the illustration changes AC to DC?	A	**B**	C	D
2202	Which section of the circuit shown in the illustration smoothes out highest degree of pulsations?	A	B	**C**	D

ID #	Question	Choice A	Choice B	Choice C	Choice D
2203	Which solid AWG wire size has the smallest physical cross-sectional area?	12	14	16	**18**
2204	Which statement is true concerning a split-phase induction motor?	Motor rotation can be reversed without changing the windings or leads.	Motor speed can be readily adjusted from zero to full speed.	The motor will run as a generator with the proper wiring.	**Motor rotation can be reversed by reversing the leads on the starting winding.**
2205	Which statement is TRUE concerning electric propulsion drives?	**The propeller speed and direction of rotation are easily controllable.**	Lower transmission losses compared to other types of propulsion drives.	Lack of flexibility of arrangement between the prime mover and motor.	Inability to be utilized as a source of ships service power.
2206	Which statement is true concerning the charging a wet cell nickel-cadmium battery?	The charging rate should never allow gassing.	Extended trickle charging should be avoided.	**The specific gravity of the electrolyte will be generally unaffected by the state of charge.**	add distilled water just prior to charging to insure proper mixing
2207	Which statement is true concerning the total power consumed in a parallel circuit?	The total power is the sum of the powers consumed by each load (resistor) divided by the number of loads.	The total power is always less than the power consumed by the smallest load.	**The total power is equal to the sum of the powers consumed by each individual load.**	The total power is never more than the power consumed by the largest load.
2208	Which statement is true if the pointer of the synchroscope is rotating in the slow direction (counterclockwise) as you are preparing to parallel two alternators?	The incoming machine is turning faster than the load alternator.	**The loaded alternator is turning faster than the incoming machine.**	The load on the loaded alternator is ready to split	The incoming machine is beginning to pick up some of the load
2209	Which statement regarding moisture absorbed in the windings or condensed on the surface of electrical machinery insulation is true?	Moisture is good for long term preserving since most insulation is organic and contains some amount of moisture anyway.	**Moisture lowers the insulation value and is a common cause of fault grounds in idle machines.**	Moisture will enhance insulation resistance only if it is fresh water and contains no salt.	Moisture reduces the amount of current supplied or drawn by the machine so horsepower is limited.
2210	Which type of AC single-phase motor will also operate on direct current?	Split-phase	**Series-wound**	Shaded-pole	Repulsion-start
2211	Which type of flux should be used when soldering electrical wire connections for electronic components on printed circuit boards?	Silver flux	**Rosin flux**	Solid flux	Acid flux

ID #	Question	Choice A	Choice B	Choice C	Choice D
2212	While on watch in the engine room, you are setting up to parallel alternators. The switchboard has a synchroscope and two synchronizing lamps used as a backup means of synchronization. If the synchoscope is broken, which of the steps listed is the most essential before an alternator can be paralleled with the bus, assuming the incoming machine alternator frequency is slightly higher than that of the bus?	The breaker should be closed when one synchronizing lamp is dark and the other is bright.	The breaker should be closed when both synchronizing lamps are bright.	**The breaker should be closed when both synchronizing lamps are dark.**	A portable phase sequence indicator must be used to verify the information from the lamps.
2213	While paralleling two (2) AC generators using synchronizing lamps only, when will both lamps will go dark?	when the generators are running at the same speed	when the generators are running at different speeds	when the generators are out of synchronism	**when the generators are in synchronism**
2214	While paralleling two alternators, the synchronizing lamps remain lit as the synchroscope pointer approaches the 0°. What would this indicate?	incoming alternator is running too fast	alternator voltages are equal	**synchroscope is defective or broken**	alternator power factors are in phase
2215	While standing an "at sea watch" onboard a modern rectified DC diesel-electric drive ship you notice the transformer core temperature slowly rising. What should be your FIRST action?	**check the transformer ventilation fans for proper operation**	notify the bridge that you need to slow down	send the oiler to look for fires in the transformer	reduce load by tripping lighting circuits
2216	While standing an "at sea watch" onboard an AC diesel-electric drive ship with a synchronous propulsion motor, you notice that the kwatt load is at roughly 75% of capacity with a leading power factor less than 1. Ideally what would be the character of the power factor associated with the main power distribution including all motors?	leading	lagging	zero	**unity**
2217	While standing watch onboard a modern rectified diesel-electric propulsion drive ship, you notice the main transformer core temperature slowly rising. What should be your FIRST action?	**check the transformer ventilation fans for proper operation**	notify the bridge that you need to slow down	send the oiler to look for fires in the transformer	reduce load by tripping lighting circuits
2218	While testing a semi-conductor diode with an ohmmeter, both the forward and reverse readings are almost in the infinity range. What would this indicate?	good	**open**	grounded	shorted
2219	While troubleshooting a circuit in an engine room central control console, a resistor is suspected of being faulty. Which of the following precautions must be observed if an analog or digital multimeter set up as an ohmmeter is to be used to check its value?	Correct polarity must be observed because reverse bias will damage the component.	Meter leads must not be twisted so as to cancel out the individual magnetic fields.	**Resistor's circuit must be de-energized and at least one end of the resistor isolated by disconnecting.**	The meter case must be grounded prior to attaching the leads.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2220	While underway onboard a DC diesel electric drive ship, you notice excessive sparking of the brushes on the main propulsion motor. What should be your FIRST action?	**notify the bridge that you will need to slow down to reduce the electrical load**	decrease the speed of the main generator	decrease the main generator voltage	decrease the motor field current
2221	Why are amortisseur windings installed within a synchronous motor?	reduce eddy current losses	produce a higher power factor	**provide a means for starting**	eliminate arcing between the stator and the rotor
2222	Why are armature cores in a DC generator made of laminated steel sheets?	fit the curvature of the frame	increase the hysteresis effect	**reduce eddy current losses**	allow for easy assembly
2223	Why are electric strip heaters used in motor controllers?	prevent freezing of movable contacts	keep the components at their design ambient temperature	**prevent condensation of moisture**	minimize resistance in internal circuits
2224	Why are external shunts sometimes used with ammeters?	to increase meter sensitivity	to permit shunts with larger resistances to be utilized	**to prevent damage to the meter movement from heat generated by the internal shunt**	to reduce reactive power factor error
2225	Why are large cable sizes often formed as individual conductors comprised of several smaller strands?	**obtain the flexibility required for easy handling and reduces skin effect losses**	reduce the overall weight of the wire run	reduce the number of supports needed for a horizontal overhead run	reduce the resistance to current flow for a given wire size
2226	Why are modern DC generators fitted with commutating poles?	they prevent motorizing	**they reduce sparking**	they reduce the load on the main poles	they reduce spring pressure on the brushes
2227	Why are motor controllers seldom troubled by grounds?	cabinet heaters always keep internal components dry	special insulation is used on wire for vital circuits	shock mounts on controller panels greatly reduce vibration	**contactors and relays are mounted on non-conducting panels**
2228	Why are motor controllers seldom troubled with grounds?	the auxiliary contacts have a high resistance connection	**the contactors and relays are mounted on a non-conducting panel**	the resistor banks are composed of individual series-connected units	there are separate switches for the motor and the control
2229	Why are nickel-cadmium batteries superior to lead-acid batteries for standby service?	**they are able to hold their charge for long periods of time without recharging**	they need fewer cells connected in series for the same voltage and require less mounting space	the have higher output voltages for the same number of cells and require no maintenance	they have a lower cost of acquisition

ID #	Question	Choice A	Choice B	Choice C	Choice D
2230	Why are space heaters provided on larger generators?	keep the machine at ambient temperature of the machinery space	**maintain rotor and stator winding temperatures above the dew point to prevent the formation of condensation**	prevent condensation in the lube oil	prevent electrolysis due to condensation in the bearings
2231	Why are the armature cores of the D.C. motors constructed with laminated steel sheets?	eliminate hysteresis	minimize brush sparking	**reduce eddy current losses**	compensate for armature reaction
2232	Why are transformer cores laminated?	**to reduce eddy currents**	to reduce secondary flux	to reduce flux leakage flux	to reduce hysteresis
2233	Why is a damper winding designed as part of a synchronous motor?	increase efficiency	**provide starting torque**	provide excitation	eliminate slippage
2234	Why is copper often used as an electrical conductor?	has high resistance at low temperatures	has a highly polished surface	**is able to pass current with little opposition**	holds insulation together well
2235	Why is it a good practice to have the frequency of the incoming alternator adjusted slightly higher than that of the loaded alternator when manually paralleling two alternators?	**This allows the oncoming machine to accept load immediately.**	This allows the oncoming machine to be placed on line with no load.	This completely takes the load completely off the loaded alternator.	This automatically tests the reverse power relay.
2236	Why is it a poor practice to use a high wattage soldering iron when soldering or desoldering components on a printed circuit board?	The circuit board will blister and warp.	**The foil wire may become loose and separate from the circuit board.**	The circuit board material may become brittle.	The solder needs to be kept to a dull heat dissipating finish.
2237	Why is it desirable to operate paralleled AC generators at the same power factor?	**Circulating currents between alternators are kept to a minimum.**	Field excitation losses are kept to a minimum.	Generator rotors will have a lesser tendency to hunt.	Because a power factor increase will decrease kilowatt output.
2238	Why is it necessary to perform periodic testing of correctly rated and properly installed circuit breakers?	to insure they can trip faster as they increases in age	**to insure they will continue to provide the original degree of protection**	to insure they do not exceed their interrupting capacity	to insure they will be able to withstand at least 125% of applied voltage
2239	Why is motorization of an AC generator undesirable?	The generator will be damaged when it reverses its rotation.	**It puts an excessive load on the bus.**	High voltage pulses may damage the commutator.	The prime mover will be damaged when it reverses its rotation.
2240	Why must accidental grounds in a shipboard electrical distribution system be repaired as soon as possible? I. Insulation damage may result if the ground is left unrepaired. II. Power outages may result if the ground is left unrepaired.	I only	II only	**Both I and II**	Neither I nor II

ID #	Question	Choice A	Choice B	Choice C	Choice D
2241	Why must accidental grounds in a shipboard electrical system must be repaired as soon as possible?	they will result in immediate power outages	they may damage circuit breakers	they will overload the ground detection system	**they may damage insulation and may cause power outages**
2242	Why must caution be exercised during the charging of lead-acid storage batteries?	the acid will become weaker	**hydrogen gas is being continuously liberated**	both plates are changing chemically to lead sulfate	lead peroxide in the negative plate is poisonous
2243	Why should a breakable, mercury-filled thermometer NOT be used in a lead-acid battery to measure electrolyte temperature?	**accidental breakage can cause severe sparking and explosions**	accidental breakage can cause rapid oxidation of battery plates	accidental breakage can cause violent gassing at the positive plates	accidental breakage can corrosion on the battery terminals
2244	Why should battery rooms be well ventilated during the charging process?	highly poisonous gas is produced	highly combustible oxygen gas is produced	**highly explosive hydrogen gas is produced**	corrosive gases are produced
2245	Why should battery rooms we well ventilated during the charging of storage batteries?	without ventilation excessive gassing will occur	highly poisonous gases are released	**highly explosive gases will otherwise accumulate**	without ventilation the battery will not take a full charge
2246	Why should rotor-to-stator air gap readings be taken periodically on electrical generation equipment?	determine the amount of varnish that can be applied to correct insulation problems	**determine the condition of the bearings**	provide for the correct proper tightening of the field coil bolts and correct lateral adjustment of the field coils	increase machine efficiency
2247	With an accidental ground on leg B as shown in figure "A" of the illustration, which of the lamps would be brighter after the test pushbutton switch has been depressed?	Lamp A	Lamp B	**Both lamps would be equally bright**	Neither lamp would be lit
2248	With an accidental ground on leg C as shown in figure "B" of the illustration and the test pushbutton has been depressed, what would be the indication?	Lamps A and B would be brighter than normal and lamp C would be dimmer than normal	Lamps A and B would be dimmer than normal and lamp C would be brighter than normal	**All three lamps would be equally bright**	All three lamps would be dark
2249	With an accidental ground on leg C as shown in figure "B" of the illustration and the test pushbutton is not yet depressed, which of the lamps would be dimmest?	Lamps A and B	**Lamp C**	All three lamps would be equally bright	All three lamps would be dark
2250	With an accidental ground on leg C as shown in figure "C" of the illustration, what would be the indication?	Lamp L would be dark due to balanced voltages across the transformer secondaries	**Lamp L would be bright due to unbalanced voltages across the transformer secondaries**	Lamp L would be dark due to unbalanced voltages across the transformer secondaries	Lamp L would be bright due to balanced voltages across the transformer secondaries

ID #	Question	Choice A	Choice B	Choice C	Choice D
2251	With power available at the fuses and the motor disconnected from line, the following voltage readings are taken: Top of "Fu 1" to bottom of "Fu 2" reads 0 VAC Top of "Fu 1" to bottom of "Fu 3" reads 450 VAC Top of "Fu 2" to bottom of "Fu 1" reads 0 VAC Top of "Fu 3" to bottom of "Fu 1" reads 0 VAC What condition is indicated?	only fuse 1 is blown	only fuse 2 is blown	only fuse 3 is blown	**fuses 1 and 2 are blown**
2252	With power available at the fuses and the motor disconnected from line, the following voltage readings are taken: Top of "Fu 1" to bottom of "Fu 2" reads 0 VAC Top of "Fu 1" to bottom of "Fu 3" reads 450 VAC Top of "Fu 2" to bottom of "Fu 1" reads 450 VAC Top of "Fu 3" to bottom of "Fu 2" reads 0 VAC What condition is indicated?	only fuse 1 is blown	**on only fuse 2 is blown**	on only fuse 3 is blown	fuses 1 and 3 are blown
2253	With power available at the fuses and the motor disconnected from line, the following voltage readings are taken: Top of "Fu 1" to bottom of "Fu 2" reads 450 VAC Top of "Fu 1" to bottom of "Fu 3" reads 0 VAC Top of "Fu 2" to bottom of "Fu 1" reads 450 VAC Top of "Fu 2" to bottom of "Fu 3" reads 0 VAC What condition is indicated?	only fuse 1 is blown	only fuse 2 is blown	**only fuse 3 is blown**	fuses 1 and 2 are blown

ID #	Question	Choice A	Choice B	Choice C	Choice D
2254	With power available at the fuses and the motor disconnected from line, the following voltage readings are taken: Top of "Fu 1" to bottom of "Fu 2" reads 450 VAC Top of "Fu 1" to bottom of "Fu 3" reads 450 VAC Top of "Fu 2" to bottom of "Fu 1" reads 0 VAC Top of "Fu 3" to bottom of "Fu 1" reads 0 VAC What condition is indicated?	**only fuse 1 is blown**	only fuse 2 is blown	only fuse 3 is blown only	Both fuses 2 and 3 are blown
2255	With regard to the maintenance of electrical generating machines with insulated pedestal bearings, what practice should be avoided?	touching the bearing shell while the machine running	using a megohm meter with the machine disassembled to determine insulation values	**painting or allowing grease build up on the insulated area**	cleaning and removing grease from the insulated area
2256	With respect to a motor, what is meant by the term 'ambient' temperature?	amount of temperature rise of an electric motor with no load	**temperature of the compartment where the motor is located**	normal electric motor operating temperature, less the room temperature	actual temperature developed by an operating motor
2257	With respect to electric motors, what does the term ambient temperature mean?	amount of permissible temperature rise	amount of temperature developed by an operating motor	normal operating temperature, less the room temperature	**temperature of the immediate surroundings**
2258	With respect to electrical enclosure types, how may an electric motor be designed and constructed?	short proof	ground proof	**explosion proof**	overload proof
2259	With respect to motors, how is ambient temperature defined?	amount of temperature rise with no load	amount of temperature developed by an operating motor	**temperature of the compartment where the motor is located**	normal operating temperature, less the room temperature
2260	With respect to motors, what does ambient temperature represent?	amount of permissible temperature rise	amount of temperature developed by an operating motor	normal operating temperature, less the room temperature	**temperature of the surroundings**
2261	With respect to the rotation of the synchroscope pointer, when two AC generators are being paralleled, under what condition should the breaker be closed?	rotating in the 'slow' direction, just before the 12 o'clock position	rotating in the 'fast' direction, just after the 12 o'clock position	**rotating in the 'fast' direction, just before the 12 o'clock position**	rotating in the 'slow' direction, just after the 12 o'clock position

ID #	Question	Choice A	Choice B	Choice C	Choice D
2262	With the switch closed in the circuit illustrated in figure "B", what is the total power consumed by the loads if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively?	2 watts	12 watts	**48 watts**	288 watts
2263	With what device is the RPM of an AC generator indirectly measured on a switchboard when operating singly (no other generator connected to the bus)?	voltmeter	synchronizing lamps	**frequency meter**	synchroscope
2264	With what device is the simplest method of controlling the terminal voltage of compound-wound DC generator?	**hand-operated field rheostat connected in series with the shunt field circuit**	separate exciter in a series with the shunt field	carbon pile regulator in series with the load	balance coil diverting neutral current through the shunt field
2265	With what device is the specific gravity of the electrolyte in a lead-acid battery measured?	Gould plate	titration pipette	**hydrometer**	litmus paper test
2266	With what electronic circuit component are heat sinks most frequently associated with?	**power transistors**	vacuum tubes	LED's	LCD's
2267	With what kind of starting equipment are most three-phase induction motors of five horsepower or less started?	autotransformer starters	resistor starters	**across-the-line starters**	reactor starters
2268	With what material should the electrical leads and insulation on a motor be painted?	heat-resisting acrylic	heat-resisting aluminum	**insulating varnish**	insulating white lead
2269	With what measuring device is the charge of a lead-acid battery checked?	manometer	**hydrometer**	viscosimeter	ohmmeter
2270	With what tool should encrusted dirt accumulated inside a motor be removed?	**fiber scraper**	pointed welding rod	hammer and chisel	paint scraper
2271	With what units of measure is the cross-sectional area of shipboard electrical cable expressed?	millimeters	gage numbers	centimeters	**circular mils**
2272	Within the split phase family of single phase motors, what are the operational characteristics of the motor shown in figure "A" of the illustration?	Relatively low starting torque and relatively high running efficiency	Relatively high starting torque and relatively low running efficiency	**Relatively low starting torque and relatively low running efficiency**	Relatively high starting torque and relatively high running efficiency
2273	Within the split phase family of single phase motors, what are the operational characteristics of the motor shown in figure "B" of the illustration?	Relatively low starting torque and relatively high running efficiency	**Relatively high starting torque and relatively low running efficiency**	Relatively low starting torque and relatively low running efficiency	Relatively high starting torque and relatively high running efficiency
2274	Within the split phase family of single phase motors, what are the operational characteristics of the motor shown in figure "C" of the illustration?	**Relatively low starting torque and relatively high running efficiency**	Relatively high starting torque and relatively low running efficiency	Relatively low starting torque and relatively low running efficiency	Relatively high starting torque and relatively high running efficiency
2275	Within the split phase family of single phase motors, what are the operational characteristics of the motor shown in figure "D" of the illustration?	Relatively low starting torque and relatively high running efficiency	Relatively high starting torque and relatively low running efficiency	Relatively low starting torque and relatively low running efficiency	**Relatively high starting torque and relatively high running efficiency**

ID #	Question	Choice A	Choice B	Choice C	Choice D
2276	Wye-connected and delta-connected three phase alternators have different operating characteristics. In comparison to the wye-connected alternator, what is unique to the delta-connected alternator?	line voltages are equal to the vector sum of the phase voltages	phase voltages 90° out of sync	line current equal to the phase current	**line voltage equal to the phase voltage**
2277	You are attempting to parallel two AC generators and the synchroscope pointer is revolving in the slow direction. What is the oncoming generator frequency relative to that of the bus frequency?	higher than the bus frequency	**lower than the bus frequency**	the same as the bus frequency but out of phase with it	the same as the bus frequency, and the circuit breaker may be closed at any pointer position
2278	You are attempting to parallel two AC generators and the synchroscope pointer is revolving slowly in the fast direction. What should be done next?	use the governor control switch to adjust the incoming voltage so it is equal to the bus voltage	use the governor control switch to increase the speed of the machine on the line only	**close the circuit breaker when the synchroscope pointer approaches the 0° position**	use the field rheostat to adjust the speed of the incoming machine
2279	You are attempting to parallel two AC generators and the synchroscope pointer stops at a position other than 0°. What would happen if you close the circuit breaker at this position?	the incoming machine will accept all of the load	the incoming machine will trip out on low voltage release	**a hazardous condition will be created by the cross current between the machines**	a hazardous condition will be created by the incoming machine being at a higher frequency than the bus
2280	You are attempting to parallel two AC generators, and the synchroscope pointer is revolving fast in the clockwise direction. What does this indicates in terms of the frequency of the incoming machine compared to the bus frequency?	**higher than the bus frequency**	lower than the bus frequency	the same as the bus frequency and the circuit breaker may be closed at any pointer position	the same as the bus frequency but out of phase with it
2281	You are attempting to parallel two AC generators, and the synchroscope pointer is revolving in the fast direction. What is the frequency of the oncoming generator relative to the bus frequency?	**higher than the bus frequency**	lower than the bus frequency	the same as the bus frequency but out of phase with it	the same as the bus frequency and the circuit breaker may be closed at any pointer position
2282	You are calibrating an analog multimeter using internal batteries to supply power for resistance measurements. However, you are unable to adjust the pointer to 'zero' using the adjustment knob. Therefore, what should you do?	**replace the batteries in the instrument**	measure resistance by dividing the voltmeter indication by the ammeter indication	set the pointer using a bridge	change scales to the R X 100 scale and adjust using the 'zero ohms' adjusting knob

ID #	Question	Choice A	Choice B	Choice C	Choice D
2283	You are checking the supply chilled water temperature thermistor probe on a high-pressure hermetic centrifugal chiller. Using the illustrated chart, what statement is true if the supply water temperature is verified 45 ° F with a digital thermometer.	When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 11.416 volts.	When checked with control power on and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.	**When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 3.805 volts.**	When checked with control power off and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.
2284	You are checking the supply chilled water temperature thermistor probe on a high-pressure hermetic centrifugal chiller. Using the illustrated chart, what statement is true if the supply water temperature is verified 45 ° F with a digital thermometer.	When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe resistance should be 11.416 ohms.	When checked with control power off and the thermistor probe isolated, the thermistor probe resistance should be 3.805 ohms.	When checked with control power off and the thermistor probe connected into the circuit, the thermistor probe resistance should be 11.416 ohms.	**When checked with control power off and the thermistor probe isolated, the thermistor probe resistance should be 11.416 ohms.**
2285	You are in the planning stages of adding a circuit to an available spare in a distribution panel board. Assume that the circuit shall be protected with a 20 amp circuit breaker. In accordance with 46 CFR, Subchapter J (Electrical Engineering), what would be the maximum load permitted if the load will be energized continuously for 3 hours or more and the branch circuit breaker to be used is NOT rated for continuous duty at 100% of its rating?	**12 amps**	16 amps	20 amps	24 amps
2286	You are in the planning stages of installing an electrical receptacle in a receptacle branch circuit. According to 46 CFR, Subchapter J (Electrical Engineering), under what conditions do the regulations require that the electrical receptacle is to have a grounding pole?	**if it operates at 100 volts or more**	if it is in a location exposed to the weather	if it is in a location accessible to other than qualified personnel	if it is connected to a DC source
2287	You are in the planning stages of installing an electrical receptacle on a lifeboat. According to 46 CFR, Subchapter J (Electrical Engineering), what statement is true concerning receptacle connections?	**Outlets connecting a lifeboat and the vessel's electrical system must allow the plug to pull free when the lifeboat is lowered.**	Outlets connecting a lifeboat and the vessel's electrical system must have threaded plugs to prevent nuisance unpluggings.	Outlets connecting a lifeboat and the vessel's electrical system must use knotted cords to prevent nuisance unpluggings.	There are no special provisions concerning outlets connecting a lifeboat and the vessel's electrical system.

ID #	Question	Choice A	Choice B	Choice C	Choice D
2288	You are in the planning stages of making up a portable cable to be used for transmitting power from a battery charger on a ship to a charging receptacle on a lifeboat. According to 46 CFR, Subchapter J (Electrical Engineering), which of the following statements is true regarding the transmitting of power between receptacles?	The plug on the end of the cord that may be energized when unplugged from the receptacle must be male.	**The plug on the end of the cord that may be energized when unplugged from the receptacle must be female.**	The plugs on both ends of the cord must be male.	Regulations do not allow transmitting power between receptacles under any circumstances.
2289	You are in the planning stages of making up a portable cord for use on a ship with 110 VAC, 220 VAC, and 110 VDC outlets. According to 46 CFR, Subchapter J (Electrical Engineering), what statement is true concerning receptacle outlets?	Each receptacle type may use the same plug configuration, but care must be exercised in plugging in cords.	The 110 VAC and 220 VAC outlets may have the same plug configuration, whereas the 110 VDC outlets must be different to preclude plugging a cord into an outlet of incompatible power type.	The 110 VAC and 110 VDC outlets may have the same plug configuration, whereas the 220 VAC outlets must be different to preclude plugging a cord into an outlet of incompatible voltage.	**Each receptacle type must have a different plug configuration to preclude plugging a cord into an outlet of incompatible voltage or type of power.**
2290	You are in the planning stages of replacing a battery charger, where an exact duplicate of the charger to be replaced is not available. Obviously the charger must be suitable for the battery to be charged. According to 46 CFR, Subchapter J (Electrical Engineering), which of the following is a true statement concerning battery chargers?	Battery chargers incorporating grounded autotransformers must be used and if the charging voltage exceeds 20% of the battery line voltage automatic protection against reversal current must be provided.	**Battery chargers incorporating grounded autotransformers must NOT be used and if the charging voltage exceeds 20% of the battery line voltage automatic protection against reversal current must be provided.**	Battery chargers incorporating grounded autotransformers must NOT be used and if the charging voltage is less than the battery line voltage automatic protection against reversal current must be provided.	Battery chargers incorporating grounded autotransformers must be used and if the charging voltage is less than 20% of the battery line voltage automatic protection against reversal current must be provided.
2291	You are in the planning stages of replacing a battery room ventilation fan drive motor located outside of but within 5 feet of the end of the exhaust duct. According to 46 CFR, Subchapter J (Electrical Engineering), what type of motor in terms of enclosure type must be used as a replacement?	**explosion-proof**	drip-proof	totally enclosed fan-cooled	open
2292	You are in the planning stages of replacing a section of control wiring in an AC switchboard, with one end attached to a component on a hinged panel. In addition to using extra flexible wire, in accordance with 46 CFR, Subchapter J (Electrical Engineering), what criteria must be met in terms of the replacement wire?	be suitable for installation in a switchboard and be rated at least 60 degrees C or higher	**be stranded copper and flame retardant**	be solid copper and oil resistant	be No. 18 AWG or larger or be ribbon cable or similar conductor size cable

ID #	Question	Choice A	Choice B	Choice C	Choice D
2293	You are in the planning stages of setting the instantaneous trip of a ship's service generator circuit breaker. According to 46 CFR, Subchapter J (Electrical Engineering), what statement is true regarding the criteria for the instantaneous trip set point, assuming the generator is capable of being paralleled?	The trip point should be set below but as close as practical to the maximum asymmetrical short circuit current available.	**The trip point should be set above but as close as practical to the maximum asymmetrical short circuit current available.**	The trip point should be set considerably above the maximum asymmetrical short circuit current available.	The trip point should be set exactly equal to the maximum asymmetrical short circuit current available.
2294	You are in the process of paralleling two AC generators and the synchroscope pointer has stopped at a position other than 0°. What does this indicate?	**The frequency of the incoming machine is the same as the bus frequency.**	The incoming machine is in phase with the bus, but the frequency is not the same.	The circuit breaker needs to be reset.	There is an existing cross current between generators.
2295	You are in the process of replacing an ammeter in a generator control panel of an AC switchboard, and you notice that the current transformer secondary circuit is not fused. In accordance with 46 CFR, Subchapter J (Electrical Engineering), what should be your action?	install a suitable fuse (for one line only) since this must have been missed during initial inspection	install two suitable fuses (one for each line) since this must have been missed during initial inspection	install a two pole circuit breaker in the secondary circuit	**do nothing, as the secondary circuit of a current transformer must never be fused**
2296	You are paralleling two alternators. The synchronizing lamps grow dim and are totally darkened as the synchroscope pointer approaches the 0° position. What does this indicate?	the alternator voltages are 180° apart	**the circuit breaker can be closed**	the incoming alternator is running too slowly	the synchroscope is defective or broken
2297	You are reconnecting a three-phase induction motor to the supply line. To prevent possible damage to the load, due to the wrong direction of rotation, what should be done?	connect the motor and then use the 'jog' button to determine the direction of rotation	connect the phase indicator to the motor leads, rotate the motor by hand and then connect to the supply voltage	connect the phase indicator to the supply voltage then connect the motor	**check the supply line phase sequence and motor rotation with appropriate indicators, then connect correspondingly marked leads**
2298	You are testing the insulation in an AC generator with a megohmeter. What would be the indication of a resistance value associated with a dry, clean winding?	**the resistance will continue to rise as the test potential is maintained, becoming fairly steady as the leakage current stabilizes**	the resistance will remain constant as the temperature of the windings increases	the resistance will continue to drop as the potential is maintained, becoming fairly steady after 5 to 7 minutes	the resistance will stabilize after approximately 2 to 4 minutes of fluctuation

ID #	Question	Choice A	Choice B	Choice C	Choice D
2299	You have installed a Zener diode in parallel with a load. While measuring the voltage across the Zener diode it is found that it does not change as the current through the load increases. In terms of Zener diode operation, what does this mean?	**It is working as it should.**	It is shorted.	It is open.	It does not regulate as it should.

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