UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2004--FORM A

Please Print

Name: _____

Facility: _____

Docket No.: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO APPLICANT

Answer all the test items using the answer sheet provided, ensuring a single answer is marked for each test item. Each test item has equal point value. A score of at least 80% is required to pass this portion of the NRC operator licensing written examination. All examination papers will be collected 3.0 hours after the examination starts. This examination applies to a typical pressurized water reactor (PWR) nuclear power plant.

SECTION	QUESTIONS	% OF TOTAL	SCORE
COMPONENTS	1 - 22		
REACTOR THEORY	23 - 36		
THERMODYNAMICS	37 - 50		
TOTALS	50		

All work performed on this examination is my own. I have neither given nor received aid.

_____
Applicant's Signature

RULES AND GUIDELINES FOR THE NRC
GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

NOTE: The generic term "control rod" refers to the length of neutron absorber material that can be positioned by the operator to change core reactivity.

1.   Print your name in the blank provided on the cover sheet of the examination.

2.   Fill in the name of your facility.

3.   Fill in your individual docket number.

4.   Fill in your start and stop times at the appropriate time.

5.   Two aids are provided for your use during the examination:

      (1)   An equations and conversions sheet contained within the examination copy, and

      (2)   Steam tables provided by your proctor.

6.   Place your answers on the answer sheet provided. Credit will only be given for answers properly marked on this sheet. Follow the instructions for filling out the answer sheet.

7.   Scrap paper will be provided for calculations.

8.   Cheating on the examination will result in the automatic forfeiture of this examination. Cheating could also result in severe penalties.

9.   Restroom trips are limited. Only **ONE** examinee may leave the room at a time. In order to avoid the appearance or possibility of cheating, avoid all contact with anyone outside of the examination room.

10.   After you have completed the examination, sign the statement on the cover sheet indicating that the work is your own and you have neither given nor received any assistance in completing the examination.

11.   Turn in your examination materials, answer sheet on top, followed by the examination booklet, then examination aids - steam table booklets, handouts, and scrap paper used during the examination.

12.   After turning in your examination materials, leave the examination area, as defined by the proctor. If after leaving you are found in the examination area while the examination is in progress, your examination may be forfeited.

EQUATIONS

$\dot{Q} = \dot{m}c_p \Delta T$

$\dot{Q} = \dot{m}\Delta h$

$\dot{Q} = UA\Delta T$

$\dot{Q} \propto \dot{m}_{Nat\ Circ}^3$

$\Delta T \propto \dot{m}_{Nat\ Circ}^2$

$K_{eff} = 1/(1 - \rho)$

$\rho = (K_{eff} - 1)/K_{eff}$

$SUR = 26.06/\tau$

$\tau = \dfrac{\overline{\beta} - \rho}{\lambda_{eff}\ \rho}$

$\rho = \dfrac{\ell^*}{\tau} + \dfrac{\overline{\beta}}{1 + \lambda_{eff}\tau}$

$\ell^* = 1 \times 10^{-4}$ sec

$\lambda_{eff} = 0.1$ sec^{-1} (for small positive ρ)

$DRW \propto \varphi_{tip}^2/\varphi_{avg}^2$

$P = P_o 10^{SUR(t)}$

$P = P_o e^{(t/\tau)}$

$A = A_o e^{-\lambda t}$

$CR_{S/D} = S/(1 - K_{eff})$

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

$\dot{m} = \rho A\vec{v}$

$\dot{W}_{Pump} = \dot{m}\Delta P \upsilon$

$E = IR$

Eff. = Net Work Out/Energy In

$\upsilon(P_2 - P_1) + \dfrac{(\vec{v}_2^{\ 2} - \vec{v}_1^{\ 2})}{2g_c} + \dfrac{g(z_2 - z_1)}{g_c} = 0$

$g_c = 32.2$ lbm-ft/lbf-sec^2

CONVERSIONS

----

1 Mw	= 3.41 x 10^6 Btu/hr	1 Curie	= 3.7 x 10^{10} dps
1 hp	= 2.54 x 10^3 Btu/hr	1 kg	= 2.21 lbm
1 Btu	= 778 ft-lbf	1 gal$_{water}$	= 8.35 lbm
°C	= (5/9)(°F - 32)	1 ft$^3_{water}$	= 7.48 gal
°F	= (9/5)(°C) + 32		

QUESTION: 1

Which one of the following types of similarly sized valves in an operating water system produces the <u>least</u> frictional head loss when fully open?

A. Ball

B. Globe

C. Butterfly

D. Swing check

QUESTION: 2

Refer to the drawing of a spring-loaded air-operated valve shown in a throttled position (see figure below).

The figure currently depicts normal air supply pressure and an energized solenoid. What will be the valve position following a loss of electrical power to the solenoid?

A. As is

B. More open

C. More closed

D. Varies with system flow

SPRING-LOADED AIR-OPERATED VALVE
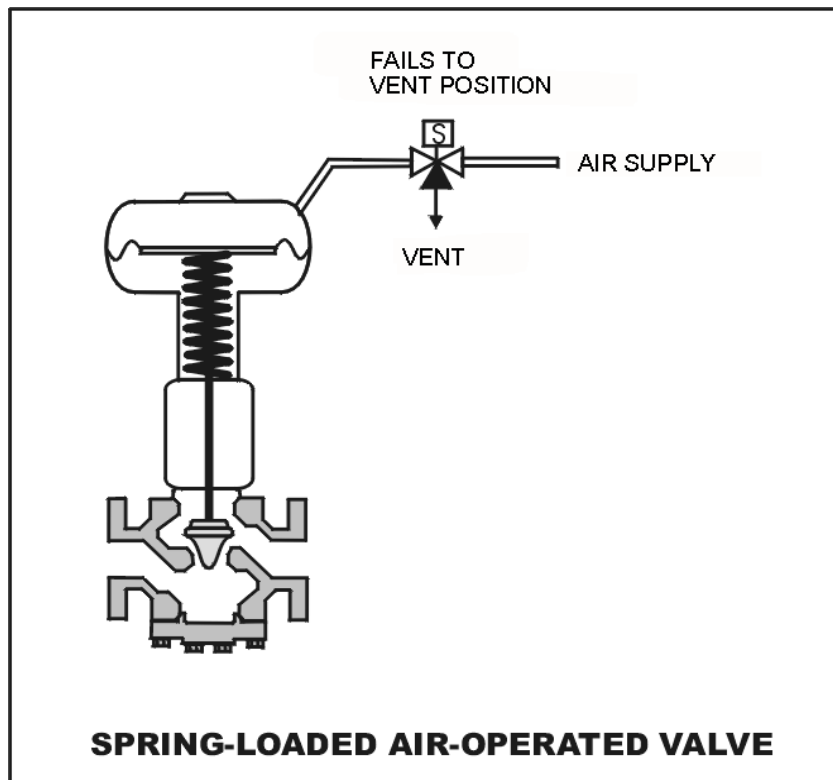
QUESTION: 3

A main steam flow rate measuring instrument uses a steam pressure input to produce main steam flow rate indication in lbm/hr. Assuming volumetric steam flow rate does <u>not</u> change, a steam pressure decrease will cause indicated steam flow rate to...

A. decrease because the density of the main steam has decreased.

B. increase because the specific volume of the main steam has increased.

C. remain the same because steam pressure does <u>not</u> affect the mass flow rate of main steam.

D. remain the same because the steam pressure input compensates for changes in steam pressure.

QUESTION: 4

Refer to the drawing of a pressurizer and differential pressure (D/P) level detector that was recently calibrated at normal operating conditions (see figure below). Assume that the associated pressurizer level instrument does <u>not</u> use density compensation.

With the nuclear power plant shut down at reduced reactor coolant system temperature and pressure, the pressurizer level instrument will indicate _____ than actual water level; the D/P currently sensed by the D/P detector is_____ than the D/P for the same pressurizer water level at normal operating conditions.

A. higher; smaller

B. higher; larger

C. lower; smaller

D. lower; larger

PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR
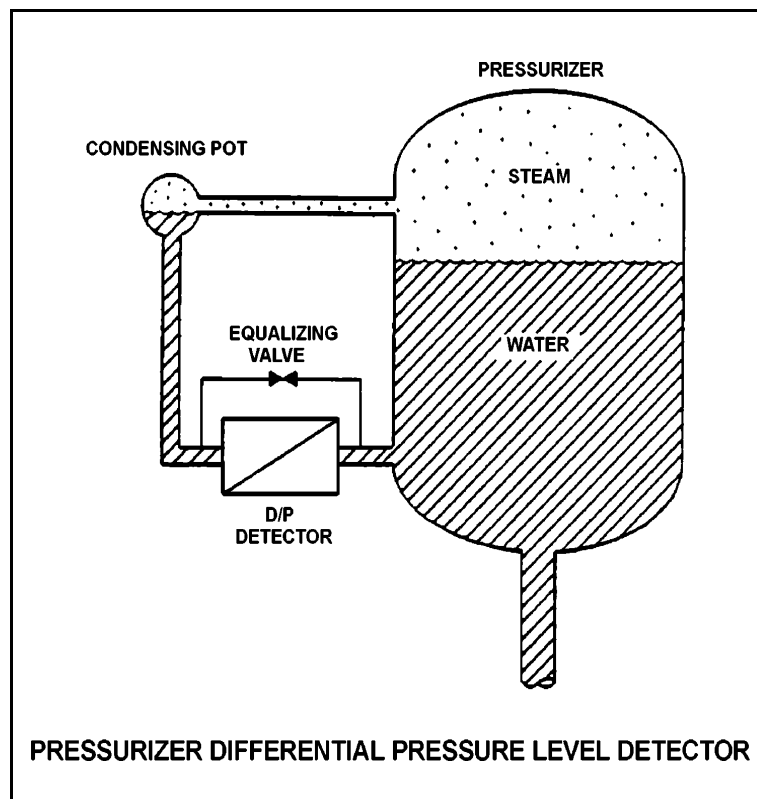
QUESTION: 5

A nuclear reactor is shut down at 100 counts per second in the source range when a loss of coolant accident occurs. How will excore source range neutron level indication change as homogeneous core voiding increases from 80% to 100%?

A. Decreases because K_{eff} is decreasing.

B. Increases because K_{eff} is increasing.

C. Decreases because a smaller fraction of the core neutron population is leaking out of the core.

D. Increases because a larger fraction of the core neutron population is leaking out of the core.

QUESTION: 6

Which one of the following describes the ion collection that occurs in a proportional counter, such as a BF_3 detector?

A. A fraction of the ions created by primary ionizations are collected. No secondary ionizations take place.

B. Virtually all of the ions created by primary ionizations are collected. No secondary ionizations take place.

C. Virtually all of the ions created by primary ionizations along with a fraction of the ions created by secondary ionizations are collected.

D. Virtually all of the ions created by primary and secondary ionizations are collected.

QUESTION: 7

An emergency diesel generator (D/G) is the only power source connected to an emergency bus. The governor of the D/G directly senses D/G _____ and adjusts D/G fuel flow to maintain a relatively constant D/G _____.

A. voltage; voltage

B. voltage; frequency

C. speed; voltage

D. speed; frequency

QUESTION: 8

An air-operated isolation valve requires 4,800 pounds-force (lbf) from its diaphragm actuator and 4 inches of stem travel for proper operation. The air supply system can provide a nominal 80 psig of air pressure to the actuator.

What is the minimum surface area of the actuator diaphragm required for proper valve operation?

A.   15 square inches

B.   60 square inches

C. 120 square inches

D. 240 square inches

QUESTION: 9

Refer to the drawing of a water storage tank with an automatic level control system (see figure below).

Given:

• The drain valve fails closed on loss of controller output signal.
• The level sensor output signal changes directly with tank water level.

For proper automatic control of tank water level, the controller must be _____; and the control loop must be _____.

A. direct-acting; open

B. direct-acting; closed

C. reverse-acting; open

D. reverse-acting; closed
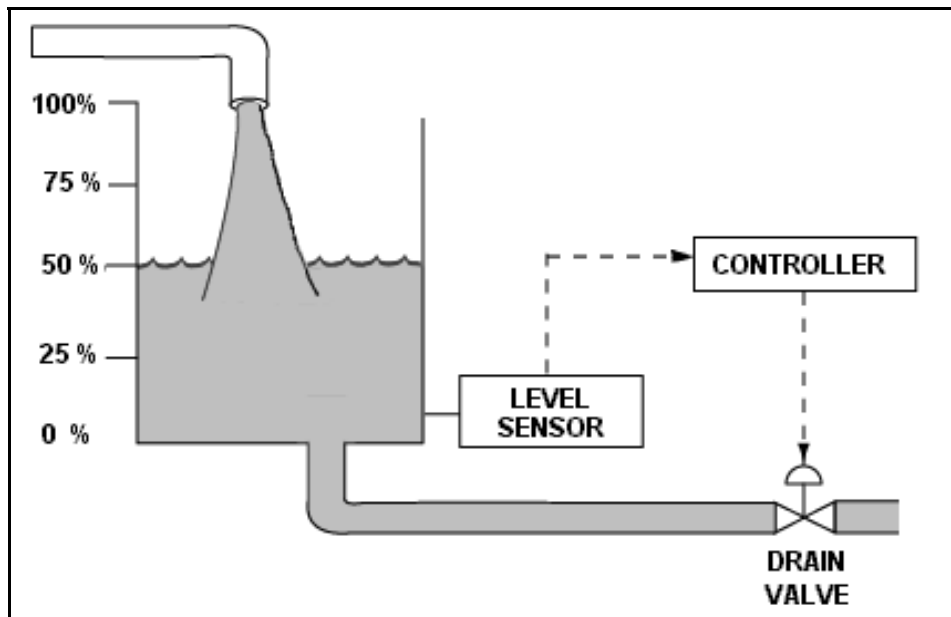
QUESTION: 10

Refer to the drawing of an elevated centrifugal pump taking suction from the bottom of an open storage tank containing water at 66°F (see figure below). Assume standard atmospheric pressure.

The pump requires 4.0 ft-lbf/lbm of net positive suction head (NPSH). Assume that pump suction fluid velocity head loss is negligible.

If tank water level is allowed to decrease continuously, at what approximate water level will the pump begin to cavitate?

A. 34 feet

B. 29 feet

C. 21 feet

D. 16 feet
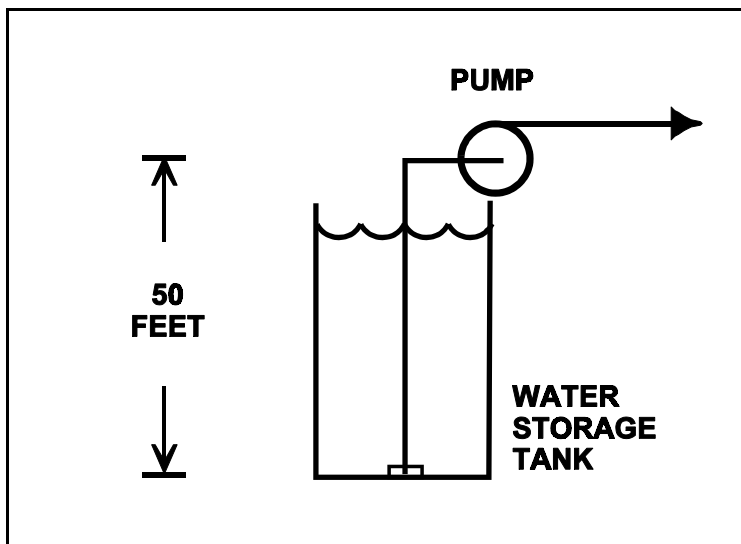
QUESTION: 11

An ac motor-driven centrifugal pump was just started. During the start, motor current remained peaked for 6 seconds before decreasing to standard running current. Normally, the starting current peak lasts about 4 seconds.

Which one of the following could have caused the extended starting current peak?

A. The pump shaft was seized and did not turn.

B. The pump was initially rotating slowly in the reverse direction.

C. The pump discharge check valve was stuck closed and did not open.

D. The pump was initially air bound, and then primed itself after 6 seconds of operation.

QUESTION: 12

A section of reactor coolant piping is being hydrostatically tested to 2,900 psig using a positive displacement pump. The operating characteristics of the positive displacement pump are shown below identifying ideal, design, and actual pump performance during the test.

Which one of the following could have caused the observed difference between the design and the actual pump performance?

A. Available NPSH decreased to slightly above the required NPSH for the pump.

B. Available NPSH decreased to slightly below the required NPSH for the pump.

C. A relief valve on the pump discharge piping failed to open at its set point of 2,900 psig.

D. A relief valve on the pump discharge piping opened prior to its set point of 2,900 psig.
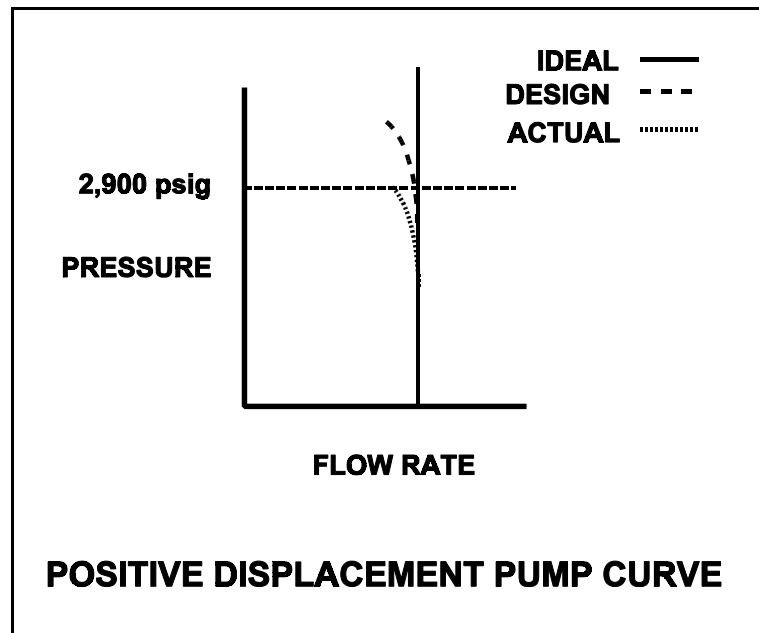
POSITIVE DISPLACEMENT PUMP CURVE

QUESTION: 13

When starting a positive displacement pump, why must the pump discharge valve be fully open?

A. Prevents pump cavitation

B. Reduces motor starting current

C. Minimizes the potential for water hammer

D. Ensures integrity of the pump and system piping

QUESTION: 14

Which one of the following breaker trip signals will trip the associated motor breaker if a motor bearing seizes while the motor is running?

A. Undervoltage

B. Underfrequency

C. Time-delayed overcurrent

D. Instantaneous overcurrent

QUESTION: 15

A main generator is operating and connected to an infinite power grid. Elevated main generator winding temperature requires a reduction in reactive load from 200 MVAR (out) to 150 MVAR (out). To accomplish the reactive load reduction, the operator must _____ the generator field current; when generator reactive load equals 150 MVAR (out) the generator power factor will be _____than the initial power factor.

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

QUESTION: 16

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Assume that the inlet lube oil and inlet cooling water temperatures are constant and cooling water flow rate remains the same. Decreasing the oil flow rate through the heat exchanger will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____.

A. increase, increase

B. increase, decrease

C. decrease, increase

D. decrease, decrease

LUBE OIL HEAT EXCHANGER
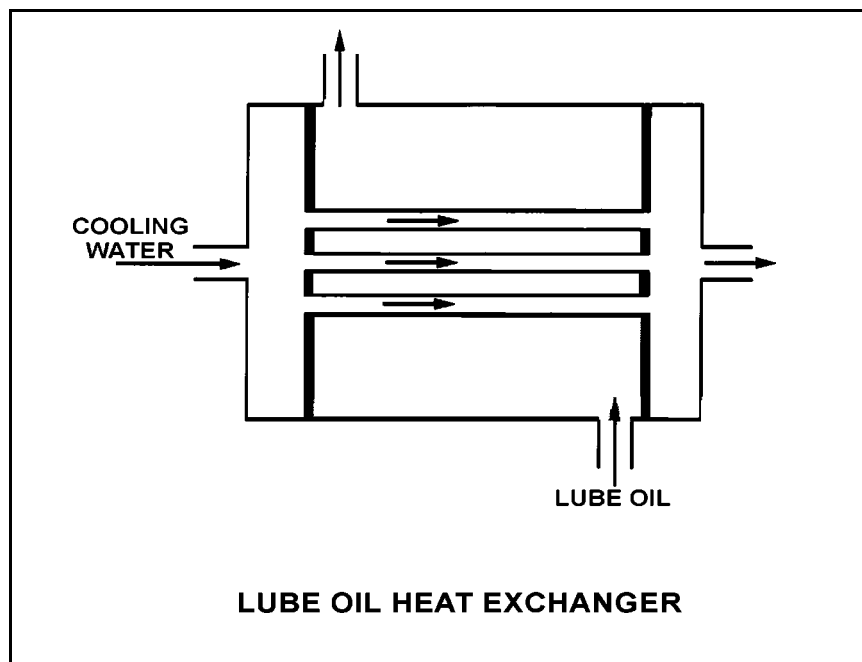
QUESTION: 17

Severe stress in a mechanical component, induced by a sudden, unequally distributed temperature reduction is a description of...

A. fracture stress.

B. brittle fracture.

C. thermal shock.

D. pressurized thermal shock.

QUESTION: 18

A higher than expected differential pressure across an operating demineralizer will be caused by...

A. depletion of the cation resin.

B. insufficient resin backwash.

C. channeling through the resin bed.

D. decreased demineralizer outlet conductivity.

QUESTION: 19

Refer to the drawing of a parallel demineralizer loop that is currently aligned for normal flow direction through the demineralizer (see figure below).

A minor seawater leak has occurred into the process water system, which is a closed system. Which one of the following will decrease the time required for the demineralizer loop to reduce the concentration of ionic impurities in the process water system?

A. Reverse the flow direction through the demineralizer.

B. Divert 50% of the loop flow to bypass the demineralizer.

C. Increase the flow rate in the loop from 95 gpm to 105 gpm.

D. Decrease the temperature in the loop from 110°F to 100°F.

PARALLEL DEMINERALIZER LOOP
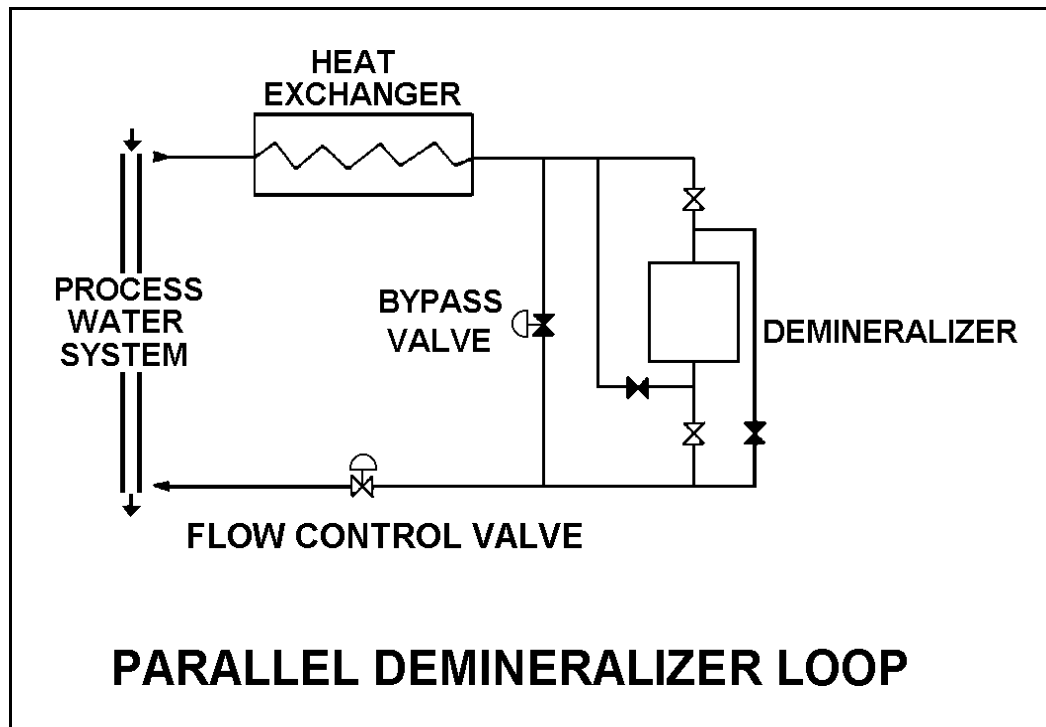
QUESTION: 20

Given the following indications for an open 4160 Vac breaker:

    All phase overcurrent trip flags are reset.
    The control power fuses indicate blown.
    The line-side voltmeter indicates 4160 Vac.
    The load-side voltmeter indicates 0 volts.

Assuming <u>no</u> operator actions were taken since the breaker opened, which one of the following could have caused the breaker to open?

A. A ground fault caused an automatic breaker trip.

B. A loss of control power caused an automatic breaker trip.

C. An operator tripped the breaker manually at the breaker cabinet.

D. An operator tripped the breaker manually from a remote location.

QUESTION: 21

When a typical 4160 volt breaker is racked to the "test" position, control power is _____ the breaker and the breaker is _____ the load.

A. available to; connected to

B. available to; isolated from

C. removed from; connected to

D. removed from; isolated from

QUESTION: 22

Refer to the simplified drawing of an electrical distribution system (see figure below).

The high voltage side of each step-down transformer has a remote-operated disconnect to allow transformer maintenance while keeping the other transformers in service. The control circuit for each disconnect is position-interlocked with the associated MCC feeder breaker.

Which one of the following describes the purpose served by the interlock?

A. Prevent damage to the disconnect.

B. Prevent damage to the transformer.

C. Prevent damage to the feeder breaker.

D. Prevent damage to the 480V MCC.

SIMPLIFIED ELECTRICAL DISTRIBUTION SYSTEM
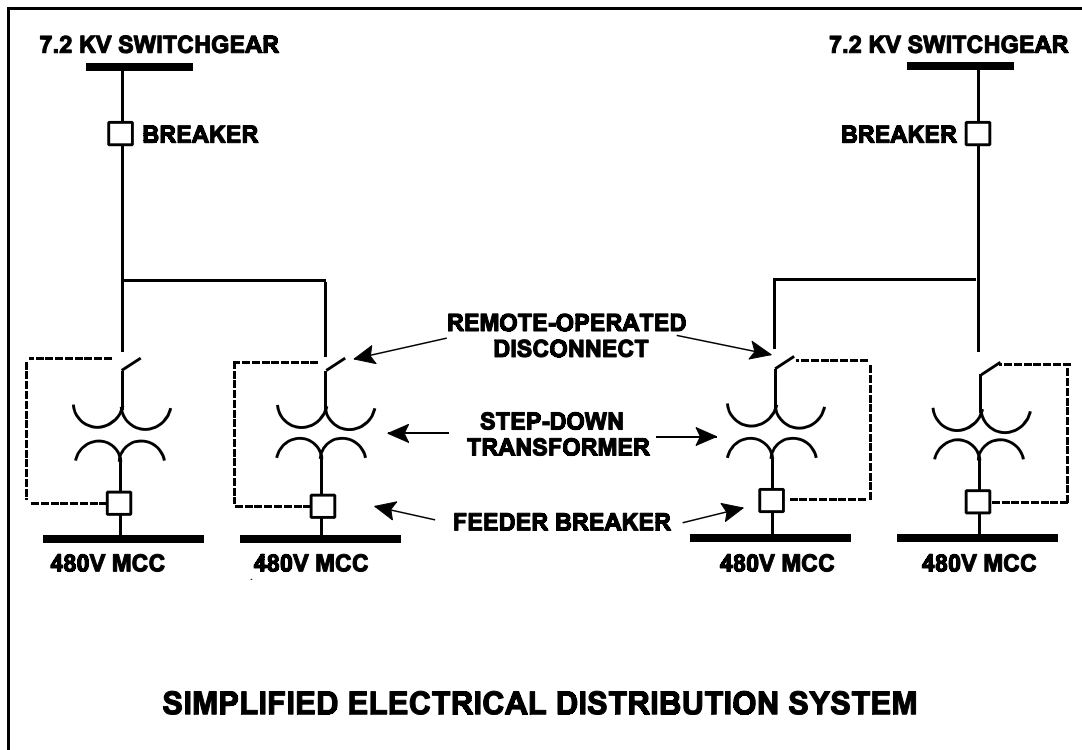
QUESTION: 23

A neutron that appears 10^{-16} seconds after the associated fission event is classified as a _____ fission neutron.

A. delayed

B. prompt

C. thermal

D. spontaneous

QUESTION: 24

Reactivity is defined as the fractional change in...

A. reactor power per second.

B. neutron population per second.

C. reactor period from criticality.

D. the effective multiplication factor from criticality.

QUESTION: 25

A nuclear reactor has a stable positive 1.0 dpm startup rate with no control rod motion several decades below the point of adding heat (POAH). The operator then inserts control rods until a 0.5 dpm startup rate is attained and then stops control rod motion.

When rod insertion is stopped, reactor startup rate will immediately...

A. stabilize at 0.5 dpm until power reaches the POAH.

B. increase, and then stabilize at a value greater than 0.5 dpm until power reaches the POAH.

C. stabilize, and then slowly and continuously decrease until startup rate is zero when power reaches the POAH.

D. increase, and then slowly and continuously decrease until startup rate is zero when power reaches the POAH.

QUESTION: 26

Which one of the following describes the net reactivity effect of a moderator temperature decrease in an overmoderated reactor core?

A. Positive reactivity will be added because fewer neutrons will be captured by the moderator.

B. Positive reactivity will be added because fewer neutrons will be absorbed at resonance energies while slowing down.

C. Negative reactivity will be added because more neutrons will be captured by the moderator.

D. Negative reactivity will be added because more neutrons will be absorbed at resonance energies while slowing down.

QUESTION: 27

The following are the <u>initial</u> conditions for a nuclear power plant:

   Reactor power is 50%.
   Average reactor coolant temperature is 570°F.

After a power increase, <u>current</u> plant conditions are as follows:

   Reactor power is 80%.
   Average reactor coolant temperature is 582°F.

Assume that the initial and current reactor coolant boron concentrations are the same. Which one of the following describes the current differential boron worth (DBW) in comparison to the initial DBW?

A. The current DBW is more negative because a 1°F increase in reactor coolant temperature will remove more boron-10 atoms from the core.

B. The current DBW is more negative because a 1 ppm increase in reactor coolant boron concentration will add more boron-10 atoms to the core.

C. The current DBW is less negative because a 1°F increase in reactor coolant temperature will remove fewer boron-10 atoms from the core.

D. The current DBW is less negative because a 1 ppm increase in reactor coolant boron concentration will add fewer boron-10 atoms to the core.

QUESTION: 28

A nuclear reactor startup is in progress from a cold shutdown condition. During the RCS heatup phase of the startup, control rod differential reactivity worth ($\Delta K/K$ per inch insertion) becomes _____ negative; and during the complete withdrawal of the initial bank of control rods, control rod differential reactivity worth becomes _____.

A. more; more negative and then less negative

B. more; less negative and then more negative

C. less; more negative during the entire withdrawal

D. less; less negative during the entire withdrawal

QUESTION: 29

A reactor is operating at steady state full power with all control rods fully withdrawn when one control rod at the core periphery falls completely into the core. Assuming no reactor trip and no operator action, which one of the following will have changed significantly as a result of the dropped rod?

A. Axial power distribution only

B. Axial power distribution and shutdown margin

C. Radial power distribution only

D. Radial power distribution and shutdown margin

QUESTION: 30

Xenon-135 is considered a major fission product poison because it has a large...

A. fission cross section.

B. absorption cross section.

C. elastic scatter cross section.

D. inelastic scatter cross section.

QUESTION: 31

Nuclear reactors A and B are operating at steady-state 100% power with equilibrium core Xe-135. The reactors are identical except that reactor A is operating at the end of core life (EOL) and reactor B is operating at the beginning of core life (BOL).

Which reactor core has the greater concentration of Xe-135?

A. Reactor A (EOL) due to the smaller 100% power thermal neutron flux.

B. Reactor A (EOL) due to the larger 100% power thermal neutron flux.

C. Reactor B (BOL) due to the smaller 100% power thermal neutron flux.

D. Reactor B (BOL) due to the larger 100% power thermal neutron flux.

QUESTION: 32

Which one of the following correctly compares the rates at which reactor power can be increased from 80% to 100% at the beginning of core life (BOL) and at the end of core life (EOL)?

A. Slower at EOL due to a lower maximum rate of reactor coolant boron dilution.

B. Slower at EOL due to lower control rod worth.

C. Slower at BOL due to a lower maximum rate of reactor coolant boron dilution.

D. Slower at BOL due to lower control rod worth.

QUESTION: 33

Why are control rod insertion limits established for power operation?

A. To minimize the worth of a postulated dropped control rod.

B. To maintain a negative moderator temperature coefficient in the reactor.

C. To provide adequate shutdown margin after a reactor scram.

D. To ensure sufficient positive reactivity is available to compensate for the remaining power defect.

QUESTION: 34

A nuclear power plant was shut down for maintenance following six months of full power operation. Now, two weeks later, the reactor has been taken critical and currently has a stable positive startup rate. All control rod motion has been stopped. Core neutron level is currently increasing slowly through the overlap region between the source and intermediate ranges.

Which one of the following describes how the fission energy is being captured and the effect on fuel temperature?

A. Most of the fission energy is transferred by the fission fragments to the other atoms in the fuel pellets; the additional fission energy raises the temperature of the fuel.

B. Most of the fission energy is transferred by the fission fragments to the other atoms in the fuel pellets; however, the fission energy is insignificant when compared to the core decay heat and does not result in a fuel temperature increase.

C. Most of the fission energy is transferred by beta and gamma radiation to the other atoms in the fuel pellets; the additional fission energy raises the temperature of the fuel.

D. Most of the fission energy is transferred by beta and gamma radiation to the other atoms in the fuel pellets; however, the fission energy is insignificant when compared to the core decay heat and does not result in a fuel temperature increase.

QUESTION: 35

During a xenon-free reactor startup, critical data was inadvertently taken two decades below the required intermediate range (IR) level. The critical data was taken again at the proper IR level with the same reactor coolant temperature and boron concentration.

The critical rod position taken at the proper IR level _____ the critical rod position taken two decades below the proper IR level.

A. cannot be compared to

B. is greater than

C. is the same as

D. is less than

QUESTION: 36

A nuclear power plant is operating with the following stable <u>initial</u> conditions:

    Power level   = 100%
    Coolant boron   = 630 ppm
    Coolant temperature = 582°F

After a normal load decrease, stable conditions are as follows:

    Power level   = 80%
    Coolant boron   = 640 ppm
    Coolant temperature = 577°F

Given the following values, how much reactivity was added by control rod movement during the load decrease? (Assume fission product poison reactivity does <u>not</u> change.)

    Total power coefficient   = -1.5 x 10^{-2}% Δk/k/%
    Moderator temperature coefficient   = -2.0 x 10^{-2}% Δk/k/°F
    Differential boron worth   = -1.5 x 10^{-2}% Δk/k/ppm

A. +0.15% Δk/k

B. +0.25% Δk/k

C. -0.15% Δk/k

D. -0.25% Δk/k

QUESTION: 37

Which one of the following is arranged from the highest pressure to the lowest pressure?

A. 2 psig, 20 inches Hg absolute, 8 psia

B. 2 psig, 8 psia, 20 inches Hg absolute

C. 8 psia, 20 inches Hg absolute, 2 psig

D. 8 psia, 2 psig, 20 inches Hg absolute

QUESTION: 38

Consider a pressurizer containing a saturated water/steam mixture at 636°F with a quality of 50%. If an outsurge removes 10% of the liquid volume from the pressurizer, the temperature of the mixture will _____ and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; decrease

B. decrease; increase

C. remain the same; decrease

D. remain the same; increase

QUESTION: 39

Saturated steam at 50% steam quality is leaving a main turbine at a flow rate of 1.0×10^6 lbm/hr and entering a condenser at 1.6 psia. Condensate is entering the hotwell at 112°F.

Which one of the following is the approximate condenser heat transfer rate?

A. 3.1×10^8 Btu/hr

B. 3.8×10^8 Btu/hr

C. 4.5×10^8 Btu/hr

D. 5.2×10^8 Btu/hr

QUESTION: 40

Refer to the drawing of two 1,000 ft^3 pressure vessels with relief protection (see figure below).

Both vessels are in saturated conditions at 281°F and approximately 35 psig. Vessel A is completely filled with saturated water. Vessel B contains one-half saturated steam (100% quality) volume and one-half saturated water (0% quality) volume. Both vessels are protected by identical relief valves.

If both relief valves begin to leak at a rate of 0.1% of design flow, the higher temperature fluid will initially be leaving the relief valve of vessel _____. And, if 100 lbm of fluid is released through both relief valves, the larger pressure decrease will occur in vessel _____.

A. A; A

B. A; B

C. B; A

D. B; B

PRESSURE VESSELS WITH RELIEF PROTECTION
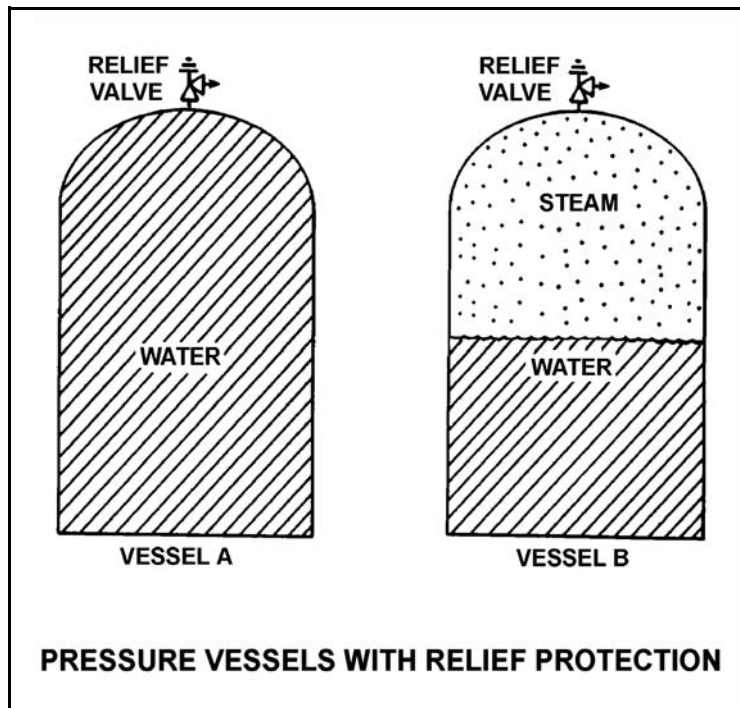
QUESTION: 41

What is the steady state effect of isolating extraction steam to a high-pressure feedwater heater while at 85% of rated power? (Assume a constant turbine load.)

A. Reactor power (MWt) increases and overall plant efficiency increases.

B. Reactor power (MWt) increases and overall plant efficiency decreases.

C. Reactor power (MWt) decreases and overall plant efficiency increases.

D. Reactor power (MWt) decreases and overall plant efficiency decreases.

QUESTION: 42

Subcooled water at 150 psig is flowing through a pipe at 500 gpm when an isolation valve instantaneously closes, causing a momentary maximum pressure increase to 450 psig at the valve. If the initial flow rate had been 1,000 gpm, what would have been the maximum pressure experienced by the isolation valve?

A. 750 psig

B. 900 psig

C. 1,350 psig

D. 1,800 psig

QUESTION: 43

Two centrifugal pumps and two positive displacement pumps are able to be cross-connected to provide makeup water flow to a system. Each pump will produce 100 gpm at 1,000 psig backpressure.

If system pressure is 800 psig, which one of the following combinations will produce the greatest flow rate to the system?

A. Two centrifugal pumps in parallel

B. Two centrifugal pumps in series

C. Two positive displacement pumps in parallel

D. Two positive displacement pumps in series

QUESTION: 44

The power range nuclear instruments have been adjusted to 100% based on a heat balance calculation. Which one of the following will result in indicated reactor power being <u>lower</u> than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 20°F higher than actual feedwater temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The feedwater flow rate used in the heat balance calculation were 10% higher than actual flow rates.

D. The operator miscalculated the enthalpy of the steam exiting the steam generators to be 10 Btu/lbm higher than actual.

QUESTION: 45

A nuclear reactor is shut down at normal operating temperature and pressure with all control rods inserted. Which one of the following will decrease the departure from nucleate boiling ratio for this reactor? (Assume the reactor remains shutdown.)

A. Fully withdrawing a bank of shutdown rods.

B. Diluting RCS boron concentration by 50 ppm.

C. Reducing RCS temperature by 5°F.

D. Decreasing RCS pressure by 10 psig.

QUESTION: 46

If the fission rate in a nuclear reactor core steadily increases, the mode of heat transfer that occurs immediately after the critical heat flux is reached is called...

A. transition boiling.

B. subcooled nucleate boiling.

C. saturated nucleate boiling.

D. stable film boiling.

QUESTION: 47

Which one of the following is most likely to result in steam bubble formation in a reactor vessel head while maintaining a 60°F subcooling margin in the hottest RCS hot leg?

A. Performing a 25°F/Hr RCS cooldown on natural circulation.

B. Performing a 50°F/Hr RCS cooldown on natural circulation.

C. Performing a 25°F/Hr RCS heatup on forced circulation.

D. Performing a 50°F/Hr RCS heatup on forced circulation.

QUESTION: 48

During a plant cooldown and depressurization with forced circulation, reactor coolant system (RCS) loop flow and reactor coolant pump (RCP) current indications become erratic. These abnormal indications are most likely caused by...

A. RCP cavitation.

B. RCP runout.

C. RCS loop water hammer.

D. RCS hot leg saturation.

QUESTION: 49

The linear power density thermal limit is designed to prevent melting of the _____ during normal reactor plant operation; the limit is dependent on the axial and radial peaking factors, of which the _____ peaking factor is the most limiting.

A. fuel clad; axial

B. fuel clad; radial

C. fuel pellets; axial

D. fuel pellets; radial

QUESTION: 50

The thermal stress experienced by the reactor vessel during a reactor coolant system cooldown is...

A. compressive across the entire vessel wall.

B. compressive at the inner wall, tensile at the outer wall of the vessel.

C. tensile across the entire vessel wall.

D. tensile at the inner wall, compressive at the outer wall of the vessel.

*** FINAL ANSWER KEY ***

SEPTEMBER 2004 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

FORM A	FORM B	ANS.	FORM A	FORM B	ANS.
1	15	A	26	40	C
2	16	B	27	41	D
3	17	A	28	42	A
4	18	A	29	43	C
5	19	A	30	44	B
6	20	D	31	45	C
7	21	D	32	46	A
8	22	B	33	47	C
9	23	B	34	48	A/B
10	24	C	35	49	C
11	25	B	36	50	C
12	26	B	37	1	A
13	27	D	38	2	B
14	28	C	39	3	D
15	29	C	40	4	D
16	30	D	41	5	B
17	31	C	42	6	Deleted
18	32	B	43	7	A
19	33	C	44	8	A
20	34	C	45	9	D
21	35	B	46	10	A
22	36	A	47	11	B
23	37	B	48	12	A
24	38	D	49	13	D
25	39	B	50	14	D