UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2006--FORM A

Please Print

Name: _____

Docket No.: _____

Facility: _____

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 your individual docket number.

3. Fill in the name of your facility.

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 and Mollier Diagram 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. Either pencil or pen may be used.

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.

GENERIC FUNDAMENTALS EXAMINATION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

$DRW \propto \varphi^2_{tip}/\varphi^2_{avg}$

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

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

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

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

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

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

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

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

$E = IR$

Eff. = Net Work Out/Energy In

$$\frac{g(z_2 - z_1)}{g_c} + \frac{(\vec{v}_2^{\,2} - \vec{v}_1^{\,2})}{2g_c} + \upsilon(P_2 - P_1) + (u_2 - u_1) + (q - w) = 0$$

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

CONVERSIONS

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1 Mw	= 3.41×10^6 Btu/hr	1 Curie	= 3.7×10^{10} dps
1 hp	= 2.54×10^3 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

Consider a 6-inch globe valve and a 6-inch gate valve in the same water system application. Typically, the valve that requires the most linear disk travel from fully closed to fully open is the _____ valve; and the valve that produces the smallest pressure drop when fully open is the _____ valve.

A. gate; gate

B. gate; globe

C. globe; gate

D. globe; globe

QUESTION: 2

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

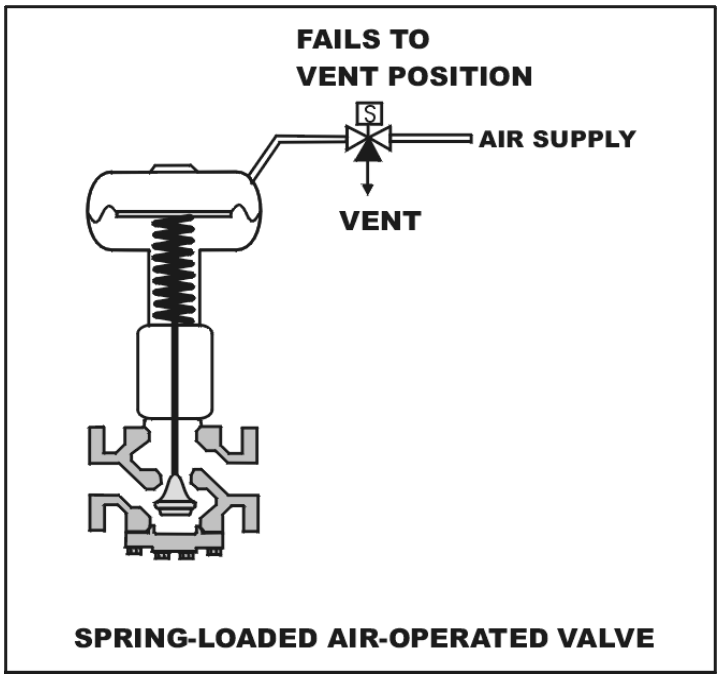
Upon a loss of air pressure, this valve will...

A. go to the fully open position.

B. remain at the current position.

C. go to the fully closed position.

D. go to the midposition.



QUESTION: 3

The most probable cause for fluctuating indication from a liquid flow rate differential pressure detector is...

A. gas or steam being trapped in the liquid.

B. unequal temperature gradients in the liquid.

C. vortexing of the liquid passing through the flow device.

D. the valve on the high pressure sensing line being partially closed.

QUESTION: 4

Semiconductor strain gages are often used in transmitters for...

A. reactor coolant pressure instruments.

B. reactor coolant temperature instruments.

C. control rod position instruments.

D. steam generator level instruments.

QUESTION: 5

Refer to the drawing of a simple thermocouple circuit (see figure below).

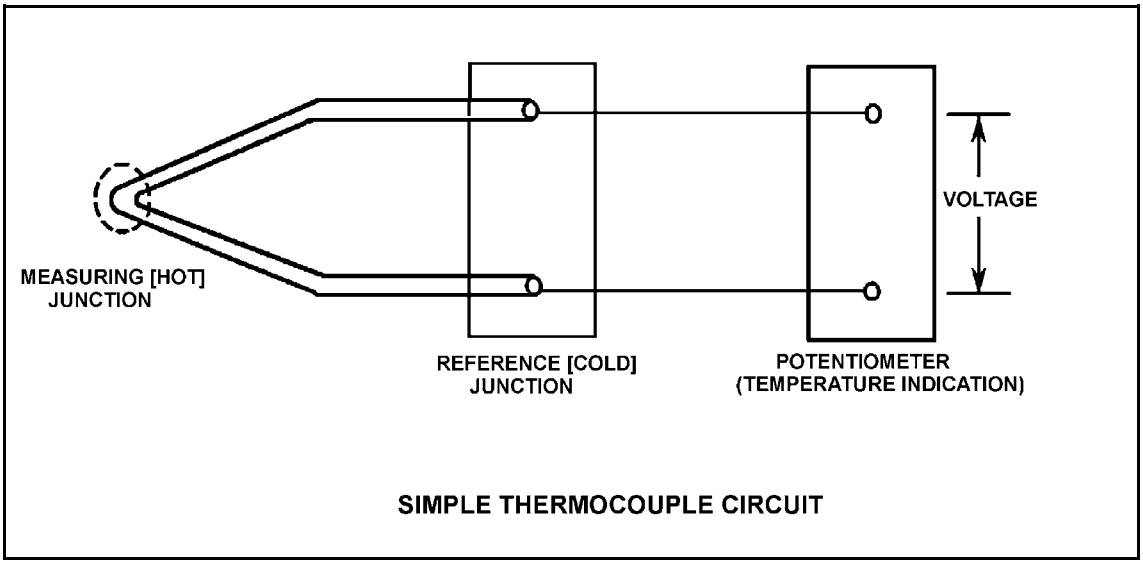
Circuit temperature indication is currently 350°F. The reference (cold) junction temperature decreases by 10°F. Assume the measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 340°F.

B. 350°F.

C. 360°F.

D. 370°F.



SIMPLE THERMOCOUPLE CIRCUIT

QUESTION: 6

Which one of the following contains the pair of radiation detector types that are the most sensitive to a low intensity field of beta and gamma radiation.

A. Geiger-Mueller and scintillation

B. Geiger-Mueller and ion chamber

C. Ion chamber and scintillation

D. Ion chamber and proportional

QUESTION: 7

Which one of the following terms is used to describe the delay between a process parameter change and the sensing of that change by the process controller?

A. Offset

B. Gain

C. Dead time

D. Feedback

QUESTION: 8

Refer to the drawing of a pneumatic control system (see figure below).

An increasing steam generator (S/G) water level will decrease the S/G level control signal and reduce the control air pressure applied to the actuator of the feed control valve.

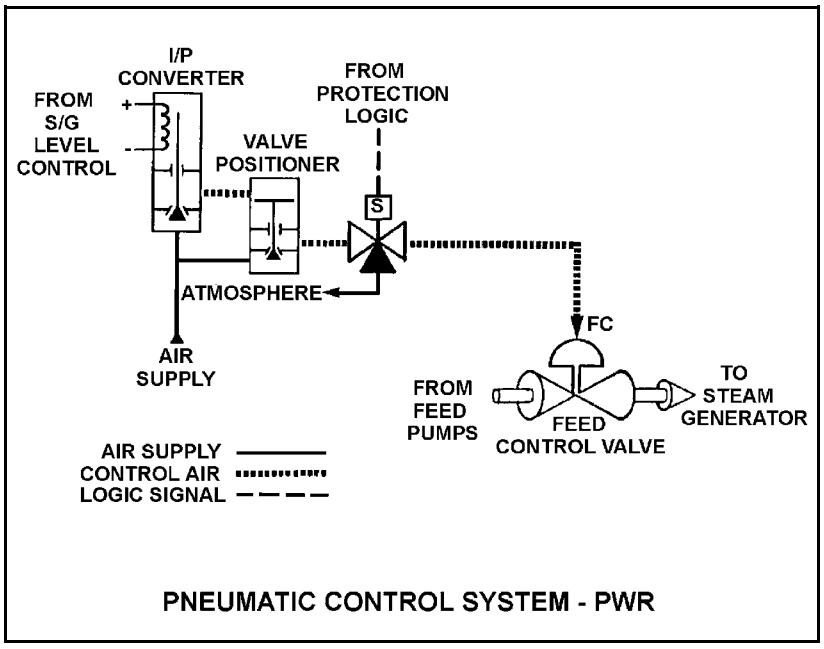
If the level control signal fails high, S/G water level will _____ because the control air pressure to the valve positioner will _____.

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase



PNEUMATIC CONTROL SYSTEM - PWR

QUESTION: 9

The water level in a water storage tank is being controlled by an automatic bistable level controller. If water level increases to 70%, the controller bistable turns off to open a tank drain valve. When water level decreases to 60%, the controller bistable turns on to close the drain valve.

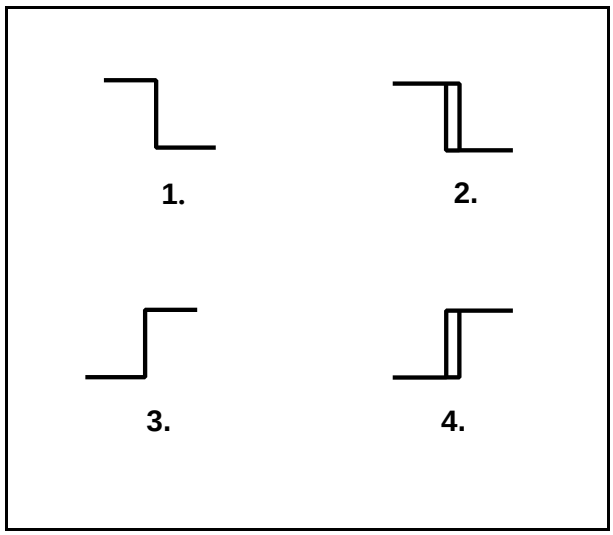
Which one of the following bistable symbols indicates the characteristics of the bistable used in the level controller?

A. 1.

B. 2.

C. 3.

D 4.



QUESTION: 10

A cooling water pump is operating with the following pump suction parameters:

Suction Temperature: 124°F
Suction Pressure: 11.7 psia

What is the approximate available net positive suction head (NPSH) for the pump? (Neglect the contribution of the suction fluid velocity to NPSH.)

A. 23 feet

B. 27 feet

C. 31 feet

D. 35 feet

QUESTION: 11

Refer to the drawing of a cooling water system in which only centrifugal pump A is operating and the common pump discharge valve is currently 90% open (see figure below).

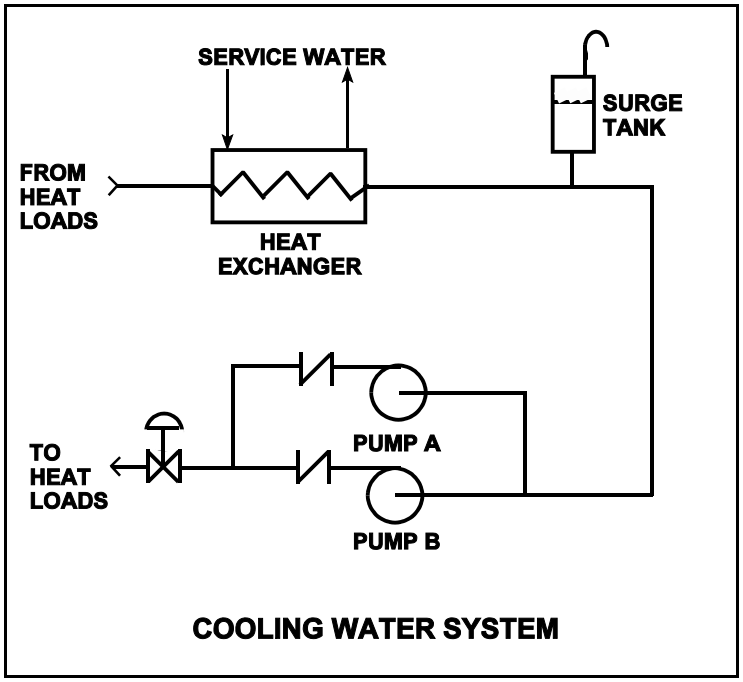
An abnormal total heat load on the cooling water system is causing pump A to approach operation at runout conditions. Which one of the following will cause pump A to operate farther away from runout conditions? (Assume that satisfactory available net positive suction head is maintained at all times.)

A. Starting pump B.

B. Positioning the discharge valve to 100% open.

C. Raising the water level in the surge tank by 2 feet.

D. Decreasing heat exchanger service water flow rate by 10%.



QUESTION: 12

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction from a water reservoir. A fire hose connected to the fire main is being used to suppress an elevated fire.

Given:

- The eye of the pump impeller is located 15 feet below the reservoir water level.
- The pump has a design shutoff head of 120 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The reservoir water temperature is 60°F.

At which one of the following elevations above the reservoir water level will the fire hose spray nozzle first be unable to provide flow? (Disregard all sources of system frictional head loss.)

A. 91 feet

B. 106 feet

C. 121 feet

D. 136 feet

QUESTION: 13

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.

A. open; open

B. open; closed

C. closed; open

D. closed; closed

QUESTION: 14

During a locked reactor coolant pump (RCP) rotor event, RCP current will...

A. increase due to the increased rotor torque.

B. increase due to the increased stator counter electromotive force (CEMF).

C. decrease due to the decreased pump flow.

D. decrease due to the increased rotor CEMF.

QUESTION: 15

Consider two identical single-speed ac induction motors, one of which is connected to a radial-flow centrifugal pump and the other to a reciprocating-type positive displacement pump (PDP). Both pumps are taking suction at the same elevation from a vented water storage tank.

Each pump has a maximum design backpressure of 800 psig, and each is operating with the following initial conditions:

Flow rate:	200 gpm
Backpressure:	400 psig
Motor current:	100 amps

If the backpressure for each pump increases to 600 psig, the centrifugal pump will have a _____ flow rate than the PDP; and the centrifugal pump will have a _____ motor current than the PDP.

A. lower; higher

B. lower; lower

C. higher; higher

D. higher; lower

QUESTION: 16

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

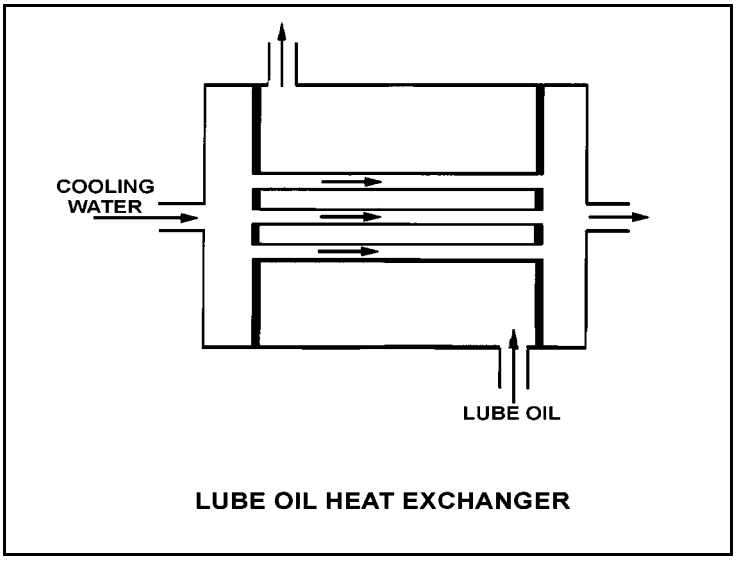
If scaling occurs inside the cooling water tubes, cooling water outlet temperature will _____ and lube oil outlet temperature will _____. (Assume oil and cooling water flow rates remain the same.)

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase



LUBE OIL HEAT EXCHANGER

QUESTION: 17

A nuclear power plant was initially operating at steady-state 50% thermal power with 50 gpm of main condenser cooling water inleakage through a cooling water tube rupture. Thermal power was then increased and is currently stable at 60%.

Assume that the size of the cooling water tube rupture does not change, and that the main condenser cooling water inlet pressure and inlet temperature do not change.

When compared to the flow rate of main condenser cooling water inleakage at 50% power, the flow rate of main condenser cooling water inleakage at 60% power is _____ because the main condenser pressure at 60% power is _____.

A. lower; lower

B. lower; higher

C. higher; lower

D. higher; higher

QUESTION: 18

A demineralizer is being used in a water purification system. How will accumulation of suspended solids in the demineralizer affect performance of the demineralizer?

A. The rate of resin depletion will increase.

B. The flow rate of water through the demineralizer will increase.

C. The differential pressure across the demineralizer will decrease.

D. The rate of unwanted ion removal from the system will decrease.

QUESTION: 19

Which one of the following indicates that a demineralizer receiving 75 gpm of reactor coolant is boron-saturated?

A. The decontamination factor of the demineralizer is less than 1.0.

B. The decontamination factor of the demineralizer is greater than 1.0.

C. Following a reactor coolant temperature increase, demineralizer effluent boron concentration exceeds influent boron concentration.

D. Following a reactor coolant temperature increase, demineralizer influent boron concentration exceeds effluent boron concentration.

QUESTION: 20

Two identical 1,000 MW electrical generators are operating in parallel supplying the same isolated electrical bus. The generator output breakers also provide identical protection for the generators. Generator A and B output indications are as follows:

Generator A	Generator B
22 KV	22 KV
60.2 Hertz	60.2 Hertz
200 MW	200 MW
25 MVAR (out)	50 MVAR (out)

A malfunction causes the voltage regulator setpoint for generator A to slowly and continuously decrease. If no operator action is taken, generator B output current will increase until...

A. the output breaker for generator A trips on overcurrent.

B. the output breaker for generator B trips on overcurrent.

C. the output breaker for generator A trips on reverse power.

D. the output breaker for generator B trips on reverse power.

QUESTION: 21

A main generator is about to be connected to an infinite power grid. Closing the generator output breaker with the generator voltage slightly lower than grid voltage and with generator frequency slightly higher than grid frequency will initially result in: (Assume no generator breaker protective trip occurs.)

A. the generator picking up reactive load from the grid.

B. the generator attaining a leading power factor.

C. the generator shedding real load to the grid.

D. motoring of the generator.

QUESTION: 22

Thermal overload devices will provide the first electrical protection for a pump motor in the event of...

A. a locked rotor upon starting.

B. an electrical short circuit.

C. gradual motor bearing damage.

D. a sheared shaft during operation.

QUESTION: 23

During a brief time interval in a typical commercial nuclear reactor operating at the beginning of a fuel cycle, 4.25×10^5 delayed neutrons were emitted.

Approximately how many prompt neutrons were emitted in the reactor during this same time interval?

A. 1.5×10^6

B. 6.5×10^6

C. 1.5×10^7

D. 6.5×10^7

QUESTION: 24

Nuclear reactors A and B are identical except that reactor A is operating near the beginning of a fuel cycle (BOC) and reactor B is operating near the end of a fuel cycle (EOC). Both reactors are operating at 100% thermal power with all control rods fully withdrawn.

Which reactor would have the lower K_{eff} five minutes after a reactor trip?

A. Reactor A, because the power coefficient is less negative near the BOC.

B. Reactor A, because the concentration of U-235 in the fuel rods is higher near the BOC.

C. Reactor B, because the power coefficient is more negative near the EOC.

D. Reactor B, because the concentration of U-235 in the fuel rods is lower near the EOC.

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 positive 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

Neglecting the effects of core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 25% power

C. 25% power to 65% power

D. 65% power to 100% power

QUESTION: 28

Which one of the following expresses the relationship between differential rod worth (DRW) and integral rod worth (IRW)?

A. IRW is the slope of the DRW curve.

B. IRW is the inverse of the DRW curve.

C. IRW is the sum of the DRWs between the initial and final control rod positions.

D. IRW is the sum of the DRWs of all control rods at any specific control rod position.

QUESTION: 29

Consider a nuclear reactor core with four quadrants: A, B, C, and D. The reactor is operating at steady state 90% power when a fully withdrawn control rod in quadrant C drops to the bottom of the core. Assume that no operator actions are taken and reactor power stabilizes at 88%.

How are the maximum upper and lower core power tilt values (sometimes called quadrant power tilt ratio or azimuthal power tilt) affected?

A. Upper core value decreases while lower core value increases.

B. Upper core value increases while lower core value decreases.

C. Both upper and lower core values decrease.

D. Both upper and lower core values increase.

QUESTION: 30

A nuclear reactor is initially operating at 50% of rated power with equilibrium core xenon-135. Power is increased to 100% over a one hour period and average reactor coolant temperature is adjusted to 588°F using manual rod control. Rod control is left in manual and no subsequent operator actions are taken.

Considering only the reactivity effects of core xenon-135 changes, which one of the following describes the average reactor coolant temperature 8 hours after the power change is completed?

A. Less than 588°F and increasing slowly

B. Less than 588°F and decreasing slowly

C. Greater than 588°F and increasing slowly

D. Greater than 588°F and decreasing slowly

QUESTION: 31

A nuclear power plant is being returned to operation following a refueling outage. Fuel preconditioning requires reactor power to be increased from 10% to full power gradually over a one week period.

During this slow power increase, most of the positive reactivity added by the operator is required to overcome the negative reactivity from...

A. fuel burnup.

B. xenon buildup.

C. fuel temperature increase.

D. moderator temperature increase.

QUESTION: 32

Refer to the graph of critical boron concentration versus core burnup for a nuclear reactor core during its first fuel cycle (see figure below).

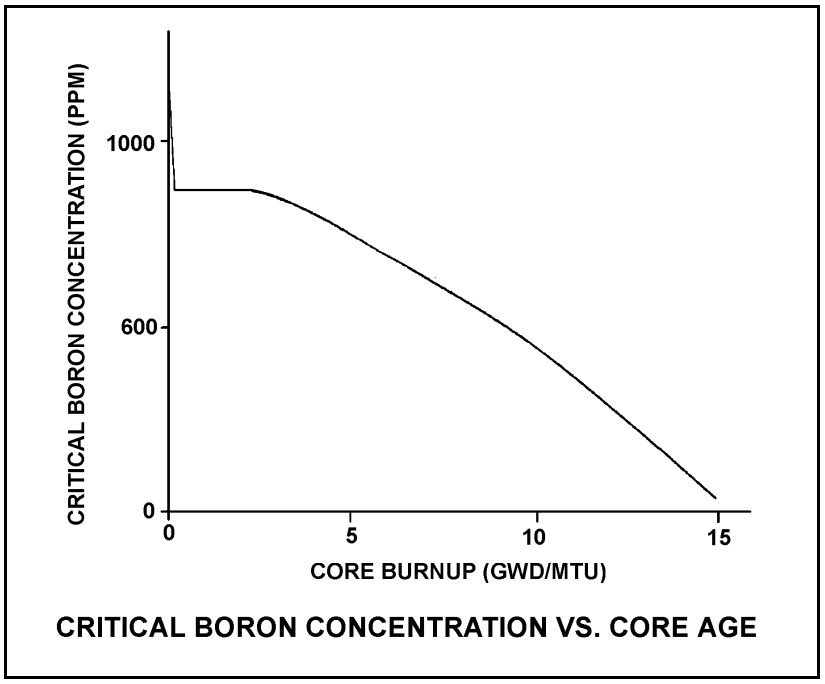
Which one of the following explains why reactor coolant critical boron concentration becomes relatively constant early in core life?

A. Buildup of fission product poisons is being offset by burnable poison burnout and fuel depletion.

B. Burnable poison burnout and fuel depletion are being offset by buildup of fission product poisons.

C. Fuel depletion is being offset by the buildup of fissionable plutonium and fission product poison buildup.

D. Fission product poison buildup and fuel depletion are being offset by burnable poison burnout.



CRITICAL BORON CONCENTRATION VS. CORE AGE

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

As a nuclear reactor approaches criticality during a reactor startup it takes longer to reach an equilibrium neutron count rate after each control rod withdrawal due to the increased...

A. length of time required to complete a neutron generation.

B. number of neutron generations required to reach a stable neutron level.

C. length of time from neutron birth to absorption.

D. fraction of delayed neutrons being produced as criticality is approached.

QUESTION: 35

A nuclear reactor is critical below the point of adding heat (POAH). The operator adds enough reactivity to attain a startup rate of 0.5 decades per minute. Which one of the following will decrease first when the reactor reaches the POAH?

A. Pressurizer level

B. Reactor coolant temperature

C. Reactor power

D. Startup rate

QUESTION: 36

A nuclear power plant is operating at 100% power near the end of core life. The greatest contribution to core heat production is being provided by the fission of...

A. U-235 and U-238.

B. U-235 and Pu-239.

C. U-238 and Pu-239.

D. U-238 and Pu-241.

QUESTION: 37

A water storage tank is enclosed to prevent vapors from escaping to the environment. The tank is also pressurized to prevent boiling. A differential pressure detector with a dry reference leg is used to measure the tank level.

To achieve the greatest accuracy of measurement, the low pressure side of the detector should sense which one of the following?

A. The pressure at the bottom of the tank

B. The pressure of the atmosphere surrounding the tank

C. The pressure of a column of water external to the tank

D. The pressure of the vapor space at the top of the tank

QUESTION: 38

Consider a water/steam mixture with a current quality of 99%. If pressure remains constant and heat is removed from the mixture, the temperature of the mixture will _____ and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; remain the same

B. decrease; decrease

C. remain the same; remain the same

D. remain the same; decrease

QUESTION: 39

Water enters an ideal convergent-divergent nozzle with the following parameters:

Pressure = 300 psia
Temperature = 102°F
Velocity = 50 ft/sec

The velocity of the water at the throat of the nozzle is 200 ft/sec.

Given that nozzles convert enthalpy to kinetic energy, and assuming no heat transfer to or from the nozzle, what is the approximate pressure of the water at the throat of the nozzle?

A. 296 psia

B. 150 psia

C. 75 psia

D. 50 psia

QUESTION: 40

A pressurizer safety valve is leaking by, allowing the 100% quality steam in the pressurizer to flow to the pressurizer relief tank (PRT). The reactor has been shut down, and a plant cooldown and depressurization are in progress. PRT pressure is being maintained constant at 20 psig.

Which one of the following describes how safety valve tailpipe temperature will be affected as pressurizer pressure slowly decreases from 1,500 psia to 500 psia? (Assume there is no ambient heat loss from the tailpipe.)

A. Increases, because the entropy of the pressurizer steam will be increasing.

B. Increases, because the enthalpy of the pressurizer steam will be increasing.

C. Decreases, because the mass flow rate of the leaking steam will be decreasing.

D. Decreases, because the temperature of the pressurizer steam will be decreasing.

QUESTION: 41

A nuclear power plant was initially operating normally at 90% reactor power when heating steam (supplied from main turbine extraction steam) to the feedwater heaters was isolated. The plant was stabilized and reactor power was returned to 90%.

As compared to the initial main generator output (MW), the current generator output is...

A. lower, because the steam cycle is less efficient.

B. higher, because the steam cycle is less efficient.

C. lower, because more steam heat energy is available to the main turbine.

D. higher, because more steam heat energy is available to the main turbine.

QUESTION: 42

A 55 gpm leak to atmosphere has developed from a cooling water system that is operating at 100 psig. Which one of the following will be the approximate leak rate when system pressure has decreased to 50 psig?

A. 27.5 gpm

B. 31.8 gpm

C. 38.9 gpm

D. 43.4 gpm

QUESTION: 43

Refer to the drawing of a cooling water system (see figure below).

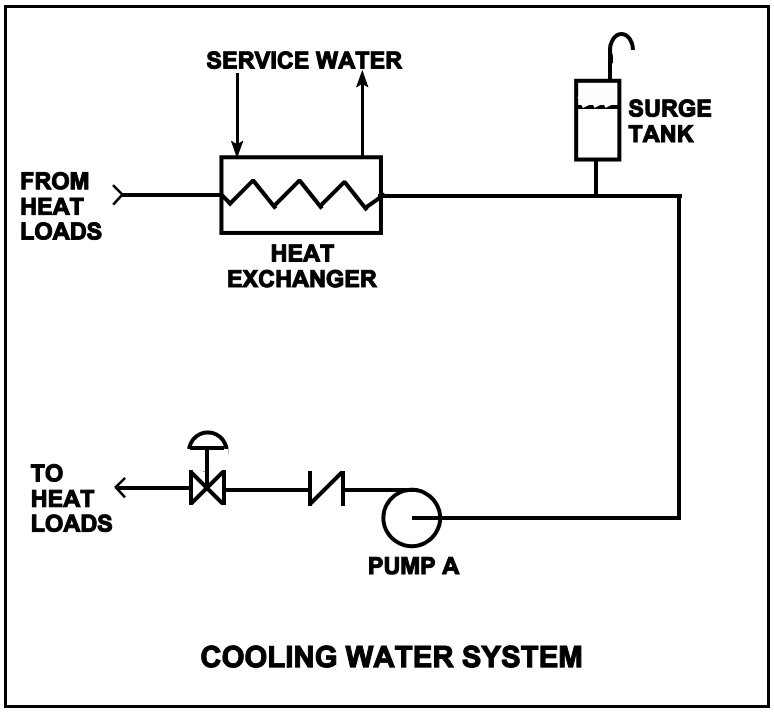
The centrifugal pump is circulating water at 100°F. Which one of the following will cause the centrifugal pump to operate closer to a condition in which gas/vapor binding can occur?

A. Surge tank level is raised by 5%.

B. Service water flow rate is decreased by 5%.

C. The pump discharge valve is used to decrease cooling water system flow rate by 5%.

D. Makeup water containing a high concentration of total dissolved solids is added to the cooling water system.



QUESTION: 44

Which one of the following describes a heat transfer flow path in which conduction is the most significant heat transfer mechanism?

A. From the reactor fuel to the core barrel during core uncovery

B. From the main turbine exhaust steam to the atmosphere via main condenser cooling water and a cooling tower during normal operation

C. From the reactor fuel to the steam outlet of the steam generators during a station blackout

D. From a fuel pellet to the fuel clad via the fuel rod fill gas during normal operation

QUESTION: 45

A nuclear reactor is currently shutdown after several months of operation at full power. The shutdown cooling system is in operation, maintaining an average reactor coolant temperature of 280°F. A pressure control malfunction causes RCS pressure to slowly and continuously decrease from 100 psia while reactor coolant temperature remains constant. (Assume a normal reactor coolant flow direction through the core.)

Which one of the following describes where nucleate boiling will first occur?

A. At a scratch on the surface of a fuel rod near the top of a fuel assembly.

B. At a scratch on the surface of a fuel rod near the bottom of a fuel assembly.

C. In the bulk fluid of a coolant channel near the top of a fuel assembly.

D. In the bulk fluid of a coolant channel near the bottom of a fuel assembly.

QUESTION: 46

Following a nuclear reactor accident, transition boiling is occurring near the top of one fuel assembly coolant channel. At the coolant channel elevation where the onset of transition boiling is occurring, coolant flow is changing from _____ flow to _____ flow.

A. annular; slug

B. annular; vapor

C. bubbly; slug

D. bubbly; vapor

QUESTION: 47

Which one of the following describes the relative contributions of the convective and radiative heat transfer mechanisms, and the relationship of ΔT (T_{wall} - T_{bulk}) to heat flux, during stable film boiling heat transfer in the core?

A. Both heat transfer mechanisms are significant and ΔT increases in direct proportion to heat flux.

B. Both heat transfer mechanisms are significant and ΔT increases exponentially with heat flux.

C. Only the radiative heat transfer mechanism is significant and ΔT increases in direct proportion to heat flux.

D. Only the radiative heat transfer mechanism is significant and ΔT increases exponentially with heat flux.

QUESTION: 48

A nuclear reactor is producing 3,400 MW of thermal output with a vessel ΔT of 60°F and a vessel mass flow rate of 1.4×10^8 lbm/hour. If core ΔT is 63.6°F, what is core bypass flow rate? (Assume bypass flow ΔT equals 0°F.)

A. 7.92×10^6 lbm/hour

B. 8.40×10^6 lbm/hour

C. 1.26×10^8 lbm/hour

D. 1.32×10^8 lbm/hour

QUESTION: 49

A PWR core consists of 50,000 fuel rods; each fuel rod has an active length of 12 feet. The core is producing 1,800 MW of thermal power. If the nuclear heat flux hot channel factor, $F_Q(z)$, (also called the total core peaking factor) is 3.0, what is the maximum local linear power density being produced in the core?

A. 4.5 kW/ft

B. 6.0 kW/ft

C. 9.0 kW/ft

D. 12.0 kW/ft

QUESTION: 50

The reference temperature for nil-ductility transition (RT_{NDT}) is the temperature above which...

A. a large compressive stress can result in brittle fracture.

B. a metal exhibits more ductile tendencies.

C. the probability of brittle fracture increases.

D. no appreciable deformation occurs prior to failure.

***** FINAL ANSWER KEY *****

SEPTEMBER 2006 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	C	27	41	C
3	17	A	28	42	C
4	18	A	29	43	D
5	19	C	30	44	D
6	20	A	31	45	B
7	21	C	32	46	D
8	22	D	33	47	C
9	23	B	34	48	B
10	24	A	35	49	D
11	25	A	36	50	B
12	26	C	37	1	D
13	27	A	38	2	D
14	28	A	39	3	D
15	29	B	40	4	B
16	30	D	41	5	A
17	31	B	42	6	C
18	32	D	43	7	B
19	33	C	44	8	D
20	34	B	45	9	A
21	35	B	46	10	B
22	36	C	47	11	D
23	37	D	48	12	A
24	38	A	49	13	C
25	39	B	50	14	B