UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2013--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 percent is required to pass this portion of the NRC operator licensing written examination. All examination materials will be collected 3 hours after the examination begins. This examination applies to a typical U.S. boiling water reactor (BWR) 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 INSTRUCTIONS FOR THE
NRC GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

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

NOTE: Numerical answers are rounded to the nearest whole number unless otherwise indicated.

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 times.

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 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 copy and the examination aids, e.g., steam tables, handouts, and scrap paper.

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 SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

$\ell^* = 1.0 \times 10^{-4}$ sec

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

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

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

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

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

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

$CR_1(1 - K_{eff_1}) = CR_2(1 - K_{eff_2})$

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

$P_R = \sqrt{3}IE\sin\theta$

Thermal Efficiency = 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 $= 3.41 \times 10^6$ Btu/hr

1 hp $= 2.54 \times 10^3$ Btu/hr

1 Btu $= 778$ ft-lbf

°C $= (5/9)(°F - 32)$

°F $= (9/5)(°C) + 32$

1 kg $= 2.21$ lbm

1 ft^3_{water} $= 7.48$ gal

1 gal_{water} $= 8.35$ lbm

1 Curie $= 3.7 \times 10^{10}$ dps

QUESTION: 1

A completely full water storage tank is being hydrostatically tested to 200 psig using a positive displacement pump (PDP) with a smooth and constant discharge flow rate of 8 gpm. The tank is protected by a relief valve and a safety valve; both valves discharge to the atmosphere. Each valve has an opening setpoint of 205 psig and a maximum rated discharge flow rate of 6 gpm. The PDP is inadvertently left running when tank pressure reaches 200 psig.

When conditions stabilize with the PDP still running, the relief valve will be _____ open; and the safety valve will be discharging a flow rate of approximately _____ to the atmosphere.

A. partially; 6 gpm

B. partially; 2 gpm

C. fully; 6 gpm

D. fully; 2 gpm

QUESTION: 2

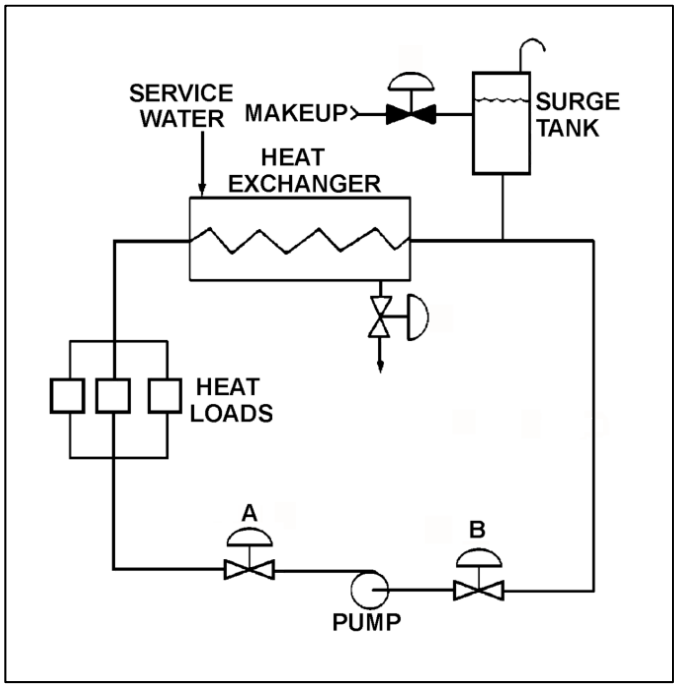
Refer to the drawing of an operating cooling water system (see figure below) in which valves A and B are identical. Valve A is one-half open and valve B is fully open. If valve A is opened fully, the differential pressure (D/P) across valve B will…

A. increase by the same amount as the absolute change in D/P across valve A.

B. increase by an amount less than the absolute change in D/P across valve A.

C. decrease by the same amount as the absolute change in D/P across valve A.

D. decrease by an amount less than the absolute change in D/P across valve A.



QUESTION: 3

A stop check valve is a type of check valve that...

A. cannot be shut remotely.

B. can be used to prevent flow in both directions.

C. contains both a gate valve disk and a check valve disk.

D. can be opened manually to allow flow in both directions.

QUESTION: 4

If the orifice in a differential pressure (D/P) flow sensor erodes such that the orifice opening becomes larger, indicated flow rate will _____ due to a _____ D/P across the orifice. (Assume actual flow rate remains the same.)

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

QUESTION: 5

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below). The level detector has just been calibrated.

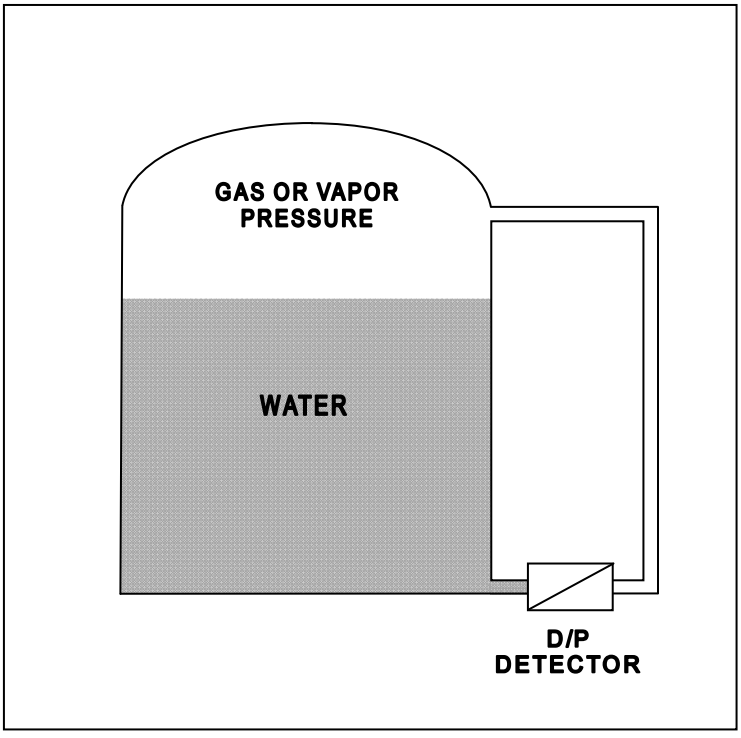
How will the indicated level be affected if condensation partially fills the normally dry reference leg?

A. Indicated level will not be affected.

B. Indicated level will be lower than actual level.

C. Indicated level will be higher than actual level.

D. Indicated level may be higher or lower than actual level depending on the pressure in the upper volume of the tank.



QUESTION: 6

Refer to the drawing of a simple thermocouple circuit (see figure below) that is calibrated for a reference junction temperature of 90°F.

Thermocouple temperature indication is currently 150°F. Indicator range is from 0°F to 2000°F.

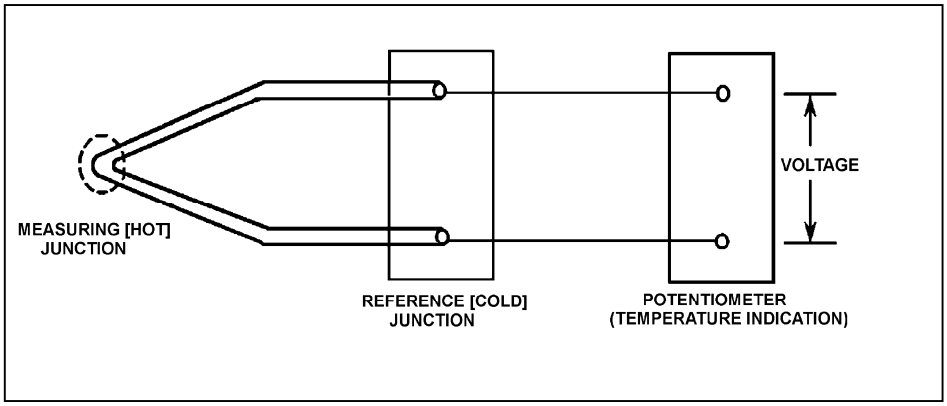
If one of the thermocouple extension wires loosens and becomes dislodged from its terminal in the reference junction panel, which one of the following temperature indications will result?

A. Minimum instrument reading (0°F)

B. 60°F

C. 90°F

D. Maximum instrument reading (2000°F)



QUESTION: 7

A beta particle and an alpha particle enter and cause ionization in a gas-filled radiation detector operating in the Geiger-Mueller region. Which one of the following accurately compares the amplitude of the detector pulses caused by each type of radiation?

A. The beta particle pulse will be larger in amplitude.

B. The alpha particle pulse will be larger in amplitude.

C. The pulses will be the same for both types of radiation.

D. Cannot be determined without particle kinetic energy information.

QUESTION: 8

The water level in a tank is being controlled by an automatic level controller using proportional-only control as shown in the figure below. Initially the tank level is stable at 50 percent, but then the flow into the tank increases and stabilizes at a higher flow rate.

As tank level increases, the controller positions the drain valve more open than necessary to stabilize the level. As tank level decreases, the controller positions the drain valve more closed than necessary to stabilize the level. This cycle is repeated continuously, never reaching a stable tank level or drain valve position.

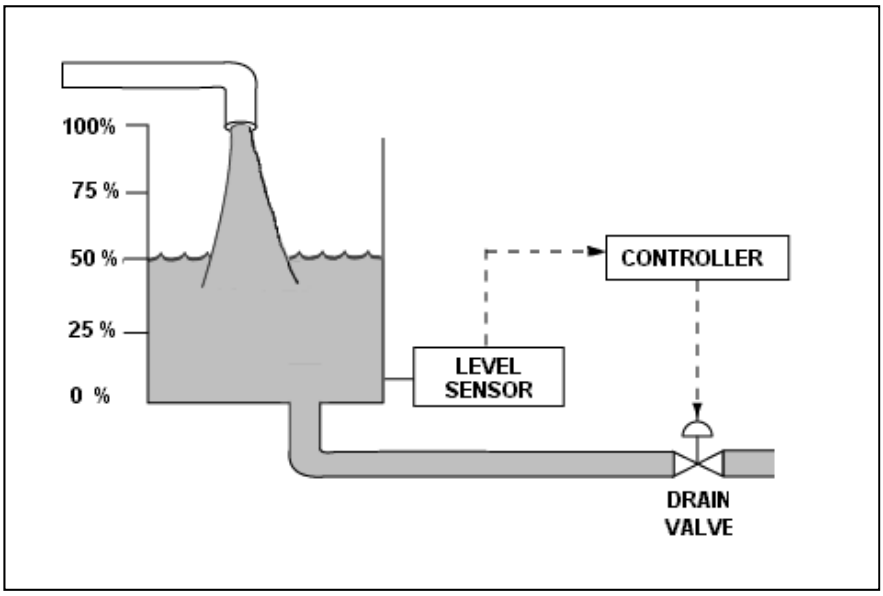
The excessive valve cycling described above can be reduced if the controller's gain is _____ or if the controller's proportional band is _____.

A. increased; widened

B. increased; narrowed

C. decreased; widened

D. decreased; narrowed



QUESTION: 9

Refer to the drawing of four bistable symbols (see figure below).

A temperature controller uses a bistable that turns on to actuate a warning light when the controlled temperature reaches a high setpoint. The bistable turns off to extinguish the warning light when the temperature decreases to 5°F below the high setpoint.

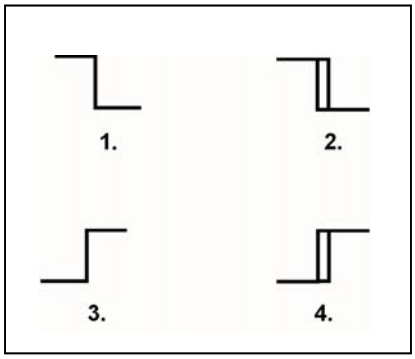
Which one of the following bistable symbols indicates the characteristics of the bistable?

A. 1.

B. 2.

C. 3.

D. 4.



QUESTION: 10

Refer to the drawing of a centrifugal pump with a recirculation line (see figure below).

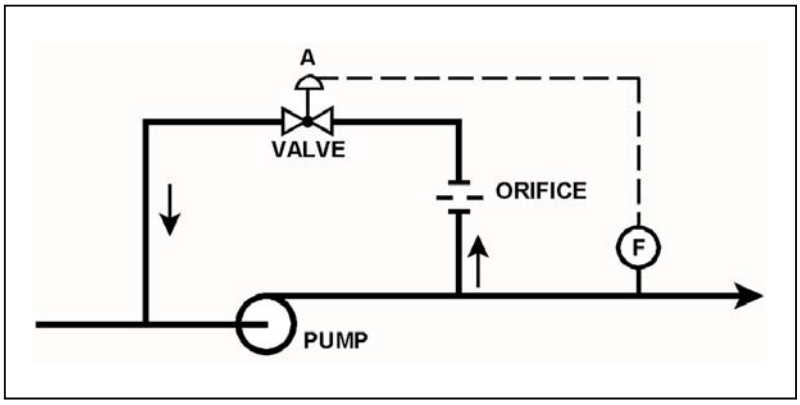
The flowpath through valve A is designed to...

A. prevent pump runout by creating a recirculation flowpath.

B. provide a small flow rate through the pump during shutoff head conditions.

C. direct a small amount of water to the pump suction to raise available net positive suction head.

D. prevent the discharge piping from exceeding design pressure during no-flow conditions.



QUESTION: 11

Refer to the pump and system curves (see figure below) for a centrifugal pump operating in a cooling water system.

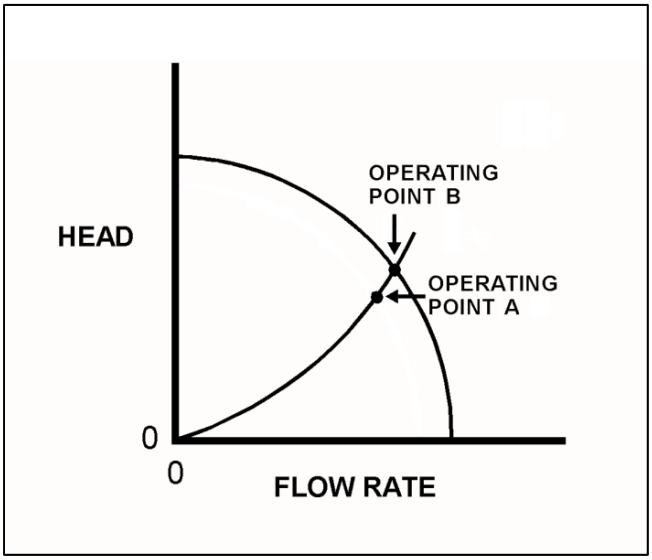
Operating point A existed when data was taken six months ago. Operating point B is the current operating point. Which one of the following could be responsible for the difference between the operating points?

A. The pump discharge valve was more open when the data was collected for operating point A.

B. The pump discharge valve was more closed when the data was collected for operating point A.

C. The pump was rotating faster when the data was collected for operating point A.

D. The pump was rotating slower when the data was collected for operating point A.



QUESTION: 12

An operating centrifugal pump has a net positive suction head (NPSH) requirement of 150 ft-lbf/lbm. Water at 300°F is entering the pump. Which one of the following is the lowest listed pump inlet pressure that will provide adequate NPSH for the pump?

A. 60 psia

B. 83 psia

C. 108 psia

D. 127 psia

QUESTION: 13

An ideal (no slip) reciprocating positive displacement pump is operating in an open system to provide makeup water to a coolant system that is being maintained at 800 psig. The discharge valve of the pump is full open.

If the pump discharge valve is subsequently throttled to 80 percent open, pump flow rate will _____; and pump head will _____.

A. decrease; increase

B. decrease; remain constant

C. remain constant; increase

D. remain constant; remain constant

QUESTION: 14

Refer to the pump performance curves for a centrifugal cooling water pump (see figure below). The pump is being driven by a single-speed AC induction motor. Pump flow rate is being controlled by a throttled discharge flow control valve.

The following initial pump conditions exist:

Motor current = 10 amps
Pump flow rate = 200 gpm

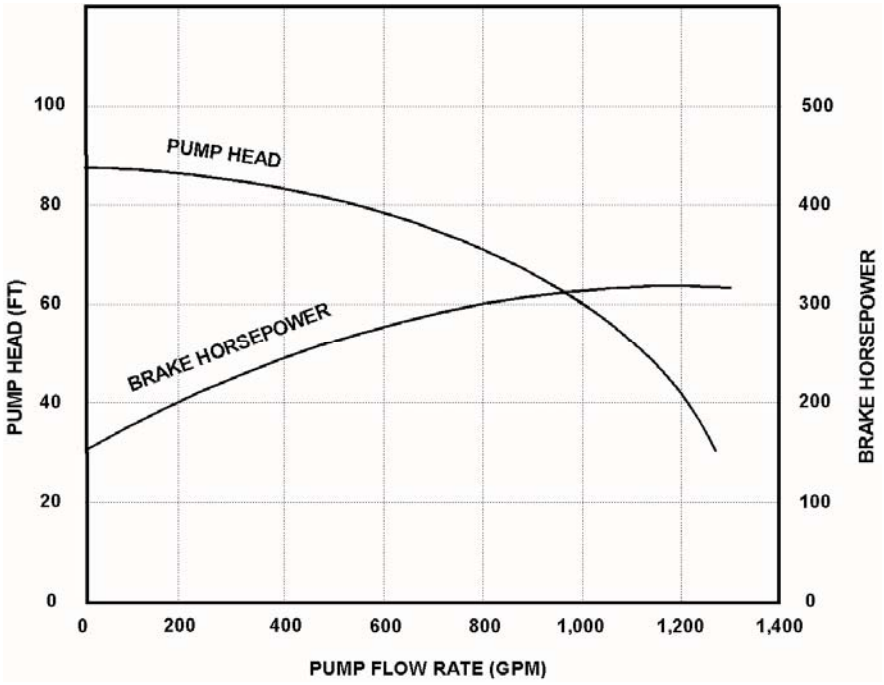
What will be the approximate value of pump motor current if the flow control valve is repositioned such that pump flow rate increases to 800 gpm?

A. 15 amps

B. 40 amps

C. 160 amps

D. Greater than 200 amps



QUESTION: 15

What is the primary reason for limiting the number of starts for an electric motor in a given period of time?

A. Prevent overheating of the windings due to high starting currents.

B. Prevent overheating of the windings due to shorting within the stator.

C. Prevent rotor damage due to excessive cyclic stresses on the shaft.

D. Prevent rotor damage due to excessive axial displacement of the shaft.

QUESTION: 16

Refer to the drawing of an operating water cleanup system (see figure below).

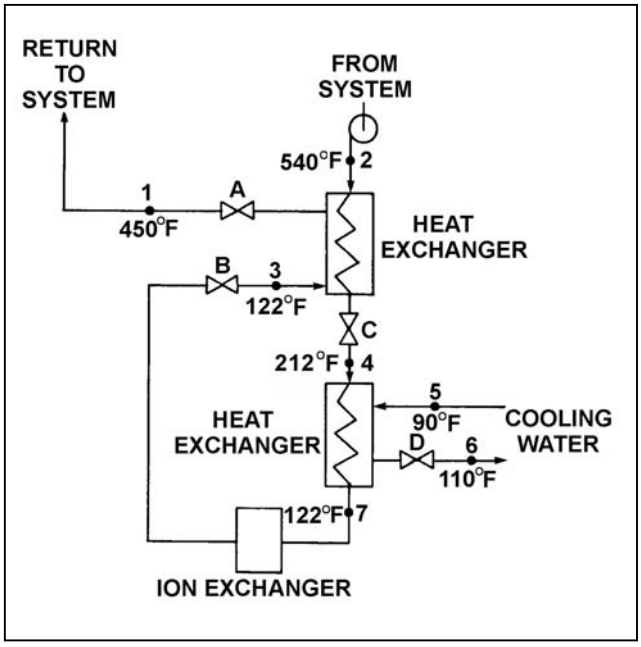
All valves are identical and are initially 50 percent open. To lower the temperature at point 7, the operator can adjust valve _____ in the open direction.

A. A

B. B

C. C

D. D



QUESTION: 17

A reactor is shut down at 400 psia when all forced core coolant flow is lost. Which one of the following will enhance natural circulation inside the reactor vessel (RV)?

A. Decrease RV pressure to 300 psia.

B. Increase RV pressure to 500 psia.

C. Decrease RV water level to just above the top of the core.

D. Increase RV water level to just above the steam separators.

QUESTION: 18

Refer to the drawing of two system curves for a typical main condenser cooling water system (see figure below).

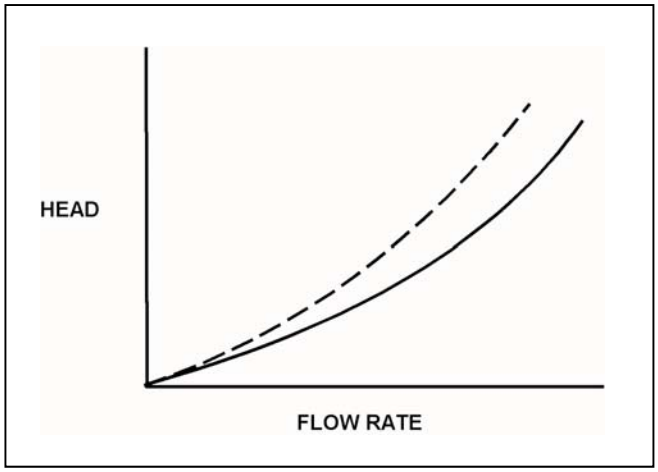
Which one of the following will cause the system curve to shift from the solid curve toward the dashed curve?

A. The main condenser tubes are cleaned.

B. The main condenser tubes become increasingly fouled.

C. Cooling water system flow rate is increased by 25 percent by starting an additional cooling water pump.

D. Cooling water system flow rate is decreased by 25 percent by stopping one of the operating cooling water pumps.



QUESTION: 19

A demineralizer is being used in a water purification system. How will the accumulation of suspended solids in the demineralizer affect the 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: 20

A mixed-bed ion exchanger is being used to process reactor coolant. The ion exchanger has been in service for 6 months at 100 percent power. A temperature controller malfunction causes the ion exchanger influent temperature to exceed the resin's maximum temperature limit before being manually restored to normal. Ion exchanger water chemistry analyses are being performed to check for resin decomposition.

Which one of the following water chemistry test results does <u>not</u> indicate that significant resin decomposition has occurred?

A. A significant decrease in the ion exchanger's decontaminator factor.

B. A significant increase in the ion exchanger's effluent conductivity.

C. A significant increase in the ion exchanger's effluent radioactivity.

D. A significant increase in the ion exchanger's effluent dissolved gases.

QUESTION: 21

Which one of the following describes the normal operation of a local breaker overcurrent trip flag indicator?

A. Actuates when no lockout is present; satisfies an electrical interlock to remotely close a breaker.

B. Actuates when a breaker overcurrent trip has occurred; can be manually reset when the overcurrent condition clears.

C. Actuates when a breaker has failed to trip on an overcurrent condition; can be manually reset when the overcurrent condition clears.

D. Actuates to cause a breaker trip when the overcurrent trip setpoint is reached; can be remotely reset when the overcurrent condition clears.

QUESTION: 22

Typical high-voltage transformer disconnect switches are designed to...

A. automatically protect the transformer from overcurrent conditions.

B. automatically trip open prior to transformer output breaker trip.

C. manually isolate the transformer during no-load conditions.

D. manually interrupt the transformer output circuit under any load when grounds are detected.

QUESTION: 23

A fast neutron will lose the greatest amount of energy during a scattering reaction in the moderator if it interacts with...

A. an oxygen nucleus.

B. a hydrogen nucleus.

C. a deuterium nucleus.

D. an electron orbiting a nucleus.

QUESTION: 24

With K_{eff} equal to 0.987, how much reactivity must be added to make the reactor critical? (Round answer to the nearest 0.01% ΔK/K.)

A. 1.01% ΔK/K

B. 1.03% ΔK/K

C. 1.30% ΔK/K

D. 1.32% ΔK/K

QUESTION: 25

A nuclear power plant has just completed a refueling outage and a reactor startup is in progress. Reactor engineers have determined that during the upcoming fuel cycle, $\bar{\beta}_{eff}$ will range from a minimum of 0.0052 to a maximum of 0.0064.

After the reactor becomes critical, control rods are withdrawn further to increase reactivity by an additional 0.1% ΔK/K. Assuming no other reactivity changes occur, what will the stable reactor period be for this reactor until the point of adding heat is reached?

A. 26 seconds

B. 42 seconds

C. 54 seconds

D. 80 seconds

QUESTION: 26

A reactor is shutdown near the end of a fuel cycle with the shutdown cooling system in service. The initial reactor vessel water temperature is 100ºF. In this condition, the reactor is overmoderated.

Then, a heatup and pressurization is performed using decay heat to bring the reactor to normal operating temperature and pressure. Assume the reactor remains subcritical.

During the heatup, K_{eff} will…

A. increase continuously.

B. decrease continuously.

C. initially increase, and then decrease.

D. initially decrease, and then increase.

QUESTION: 27

If the average temperature of a fuel pellet increases by 50°F, the microscopic cross-section for absorption of neutrons at a resonance energy of U-238 will _____; and the microscopic cross-sections for absorption of neutrons at energies that are slightly higher or lower than a U-238 resonance energy will _____.

A. decrease; increase

B. decrease; decrease

C. increase; increase

D. increase; decrease

QUESTION: 28

Which one of the following describes the change in magnitude (positive value) of integral rod worth during the complete withdrawal of a fully inserted control rod?

A. Increases, then decreases.

B. Decreases, then increases.

C. Increases continuously.

D. Decreases continuously.

QUESTION: 29

As moderator temperature increases, the differential rod worth becomes...

A. more negative due to longer neutron diffusion lengths.

B. more negative due to decreased resonance absorption of neutrons.

C. less negative due to reduced moderation of neutrons.

D. less negative due to decreased moderator absorption of neutrons.

QUESTION: 30

Reactors A and B are operating at steady-state 100 percent power with equilibrium xenon-135. The reactors are identical except that reactor A is operating near the end of a fuel cycle (EOC) and reactor B is operating near the beginning of a fuel cycle (BOC).

Which reactor has the greater concentration of xenon-135, and why?

A. Reactor A (EOC), due to the smaller 100 percent power thermal neutron flux.

B. Reactor A (EOC), due to the larger 100 percent power thermal neutron flux.

C. Reactor B (BOC), due to the smaller 100 percent power thermal neutron flux.

D. Reactor B (BOC), due to the larger 100 percent power thermal neutron flux.

QUESTION: 31

A reactor was operating at 100 percent power for one week when power was decreased to 50 percent. Which one of the following describes the equilibrium xenon-135 concentration at 50 percent power?

A. The same as the 100 percent concentration.

B. More than one-half the 100 percent concentration.

C. One-half the 100 percent concentration.

D. Less than one-half the 100 percent concentration.

QUESTION: 32

Refer to the drawing of K_{eff} versus core age (see figure below).

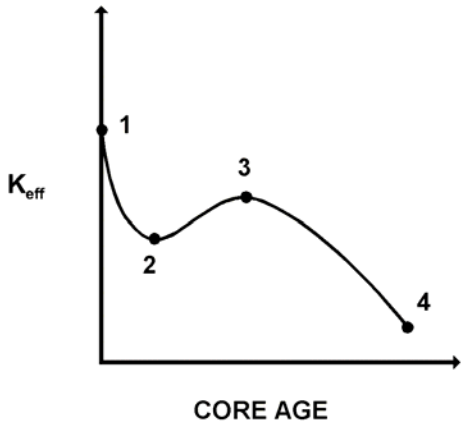
The major cause for the change in K_{eff} from point 1 to point 2 is the…

A. depletion of fuel.

B. burnout of burnable poisons.

C. initial heatup of the reactor.

D. buildup of fission product poisons.



QUESTION: 33

A nuclear power plant was operating at steady-state 100 percent power near the end of a fuel cycle when a reactor scram occurred. Four hours after the scram, reactor pressure is currently being maintained at 600 psig in anticipation of commencing a reactor startup.

Which one of the following will cause the core fission rate to decrease?

A. Core void fraction is decreased by 2 percent.

B. Reactor coolant temperature is allowed to decrease by 3 °F.

C. The operator fully withdraws the first group of control rods.

D. An additional 2 hours are allowed to pass with no other changes in plant parameters.

QUESTION: 34

When a reactor is critical, reactivity is...

A. infinity.

B. undefined.

C. 0.0 ΔK/K.

D. 1.0 ΔK/K.

QUESTION: 35

Upon reaching criticality during a reactor startup, the operator establishes a positive reactor period. Upon reaching the point of adding heat, the period will become _____ due to the _____ reactivity feedback from the moderator and fuel temperatures.

A. longer; positive

B. longer; negative

C. shorter; positive

D. shorter; negative

QUESTION: 36

Reactors A and B are identical and have operated at 100 percent power for six months when a reactor scram occurs simultaneously on both reactors. All control rods fully insert, except for one reactor B control rod that remains fully withdrawn.

Which reactor, if any, will have the longer reactor period five minutes after the scram, and why?

A. Reactor A, due to the greater shutdown reactivity.

B. Reactor B, due to the smaller shutdown reactivity.

C. Both reactors will have the same reactor period because both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same reactor period because only the longest-lived delayed neutron precursors will be releasing fission neutrons.

QUESTION: 37

A water storage tank is vented to atmosphere. The tank is located at sea level and contains 100,000 gallons of 80°F water. A pressure gauge at the bottom of the tank reads 5.6 psig. What is the approximate water level in the tank?

A. 13 feet

B. 17 feet

C. 21 feet

D. 25 feet

QUESTION: 38

The temperature of a saturated steam-water mixture is 467°F.

Which one of the following parameter values, when paired with the temperature, provides <u>insufficient</u> information to determine the quality of the mixture?

A. Pressure is 499.96 psia

B. Enthalpy is 977.33 Btu/lbm

C. Entropy is 1.17 Btu/lbm -°R

D. Specific volume is 0.817 ft^3/lbm

QUESTION: 39

A main condenser is operating at 1.0 psia. If 20,000 ft^3 of saturated steam is condensed to saturated water in the condenser, what will be the approximate volume of the saturated water?

A. 1 ft^3

B. 10 ft^3

C. 100 ft^3

D. 1,000 ft^3

QUESTION: 40

Given the following:

- A saturated steam-water mixture with an inlet quality of 70 percent is flowing through a moisture separator.
- The moisture separator is 100 percent efficient for removing moisture.

How much moisture will be removed by the moisture separator from 50 lbm of the steam-water mixture?

A. 15 lbm

B. 30 lbm

C. 35 lbm

D. 50 lbm

QUESTION: 41

Which one of the following describes pump head?

A. The fluid energy contained at the inlet of a pump.

B. The energy added by a pump in excess of shutoff head.

C. The fluid energy required to ensure a pump does not cavitate.

D. The energy added by a pump to increase fluid pressure or velocity.

QUESTION: 42

Refer to the drawing of a venturi in a main steam line (see figure below). The venturi inlet and outlet pipe diameters are equal.

A main steam line break downstream of the venturi causes the main steam mass flow rate through the venturi to increase. Soon, the steam reaches sonic velocity in the throat of the venturi.

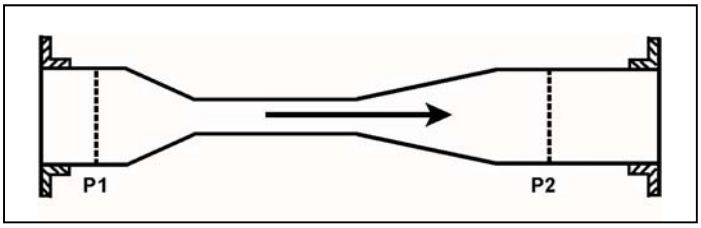
How will the main steam mass flow rate through the venturi be affected as the steam pressure downstream of the venturi continues to decrease?

A. It will continue to increase at a rate that is dependent on the steam velocity in the throat of the venturi.

B. It will continue to increase at a rate that is dependent on the differential pressure (P1 - P2) across the venturi.

C. It will <u>not</u> continue to increase because the steam velocity <u>cannot</u> increase above sonic velocity in the throat of the venturi.

D. It will <u>not</u> continue to increase because the differential pressure (P1 - P2) across the venturi <u>cannot</u> increase further once the steam reaches sonic velocity in the throat of the venturi.



QUESTION: 43

The power range nuclear instruments have been adjusted to 100 percent based on a heat balance calculation. Which one of the following will result in indicated reactor power being higher 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 recirculation pump heat input term was omitted from the heat balance calculation.

C. The feedwater flow rate used in the heat balance calculation was 10 percent lower than actual feedwater flow rate.

D. The ambient heat loss term was omitted from the heat balance calculation.

QUESTION: 44

Which one of the following describes the heat transfer from a fuel rod experiencing departure from nucleate boiling? (ΔT refers to the difference between the fuel rod surface temperature and the coolant saturation temperature.)

A. Steam bubbles begin to blanket the fuel rod surface, causing a rapid increase in the ΔT for a given heat flux.

B. Steam bubbles completely blanket the fuel rod surface, causing a rapid decrease in the ΔT for a given heat flux.

C. Steam bubbles begin to form on the fuel rod surface, causing a rapid increase in the heat flux from the fuel rod for a given ΔT.

D. Steam bubbles completely blanket the fuel rod surface, causing a rapid increase in the heat flux from the fuel rod for a given ΔT.

QUESTION: 45

A reactor is operating at steady-state 90 percent power. Which one of the following will cause the two-phase coolant flowing upward in a fuel bundle to approach the onset of transition boiling? (Assume reactor power does not change unless stated.)

A. Recirculation flow rate increases.

B. Reactor pressure decreases.

C. Feedwater temperature increases.

D. Fuel bundle power decreases.

QUESTION: 46

Refer to the drawing of a section of pipe that contains flowing subcooled water. (See figure below).

Given:

- Pressure at P_1 is 30 psig.
- Pressure at P_2 is 32 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 2 psig.

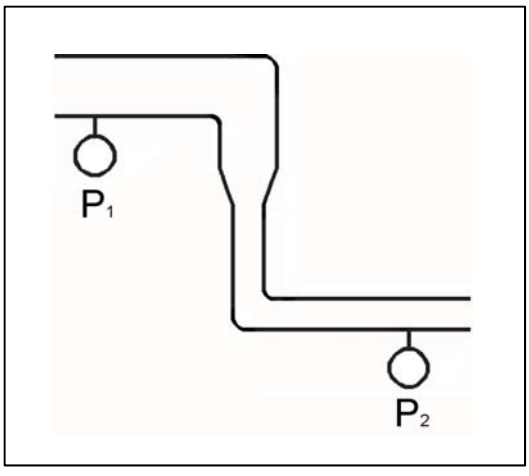
The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

A. 2 psig; left to right

B. 2 psig; right to left

C. 6 psig; left to right

D. 6 psig; right to left



QUESTION: 47

The axial peaking factor for a node of a fuel bundle is expressed mathematically as...

A. $\frac{\text{bundle average nodal power}}{\text{nodal power}}$

B. $\frac{\text{nodal power}}{\text{bundle average nodal power}}$

C. $\frac{\text{core average bundle power}}{\text{peak nodal power}}$

D. $\frac{\text{peak nodal power}}{\text{core average bundle power}}$

QUESTION: 48

The amount of heat stored in the fuel, resulting from the operating kW/foot in the fuel prior to a scram, is measured by the...

A. average planar linear heat generation rate (APLHGR).

B. linear heat generation rate (LHGR) multiplied by the total peaking factor.

C. core fraction of limiting power density.

D. APLHGR-to-MAPLHGR ratio.

QUESTION: 49

Which one of the following describes why the threshold power for pellet-clad interaction changes as fuel burnup increases?

A. The fuel pellet thermal conductivity is reduced significantly by irradiation.

B. Zirconium hydriding increases significantly as the oxide layer builds up on the cladding.

C. The buildup of certain fission product gases causes chemical embrittlement of the cladding.

D. Fuel pellet densification causes the middle of the pellet to expand outward against the cladding as the pellet length shrinks.

QUESTION: 50

Brittle fracture of a low-carbon steel is more likely to occur when the temperature of the steel is _____ the nil-ductility transition temperature; and will normally occur when the applied stress is _____ the steel's yield strength (or yield stress).

A. less than; less than

B. less than; greater than

C. greater than; less than

D. greater than; greater than

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

JUNE 2013 NRC GENERIC FUNDAMENTALS EXAMINATION
BOILING 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	A
3	17	B	28	42	C
4	18	D	29	43	A
5	19	B	30	44	C
6	20	C	31	45	B
7	21	C	32	46	D
8	22	C	33	47	D
9	23	D	34	48	C
10	24	B	35	49	B
11	25	D	36	50	D
12	26	D	37	1	A
13	27	C	38	2	A
14	28	A	39	3	A
15	29	A	40	4	A
16	30	D	41	5	D
17	31	D	42	6	C
18	32	B	43	7	B
19	33	D	44	8	A
20	34	D	45	9	C
21	35	B	46	10	B
22	36	C	47	11	B
23	37	B	48	12	A
24	38	D	49	13	C
25	39	C	50	14	A