UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2014 – 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

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

$g = 32.2\ \text{ft/sec}^2$

$g_c = 32.2$ 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

Given the following pressure specifications for a safety relief valve (SRV):

Setpoint pressure (SRV will start to open) = 1,200 psia
Maximum pressure (SRV will be fully open) = 1,242 psia
Reseat pressure (SRV will be fully closed) = 1,152 psia

Which one of the following is the percent accumulation for the SRV?

A. 2.5 percent

B. 3.0 percent

C. 3.5 percent

D. 4.0 percent

QUESTION: 2

Consider a 6-inch globe valve and a 6-inch gate valve in the same water system application. The valve that typically requires the <u>least</u> linear travel of the disk from fully closed to fully open is the _____ valve; and the valve that produces the <u>greatest</u> pressure drop when fully open is the _____ valve.

A. gate; gate

B. gate; globe

C. globe; gate

D. globe; globe

QUESTION: 3

An adjustment has just been completed on the packing gland of a motor-operated gate valve to stop a minor stem leak. Which one of the following can occur if the technician overtightened the packing gland?

A. Decreased cooling flow to the valve internals.

B. Separation of the valve disk from the valve stem.

C. Misalignment of the valve position limit switches.

D. Increased stroke time from fully open to fully closed.

QUESTION: 4

Refer to the drawing of a venturi flow element in an operating cooling water system (see figure below).

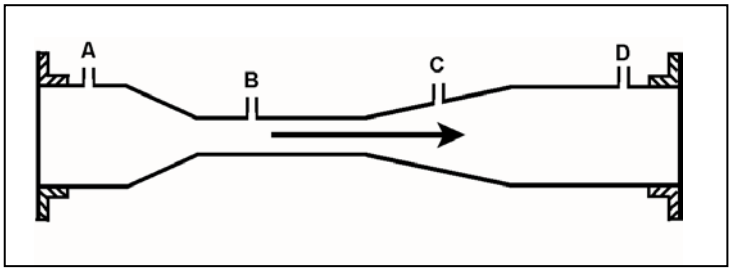
A differential pressure detector measuring flow rate through the venturi will produce the highest flow rate indication if its high-pressure tap is connected at point _____; and its low-pressure tap is connected at point _____.

A. A; B

B. A; D

C. B; C

D. B; D



QUESTION: 5

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

The water storage tank is 40 feet tall. The level detection system is calibrated to provide a level indication of 30 feet when the tank and reference leg levels are equal.

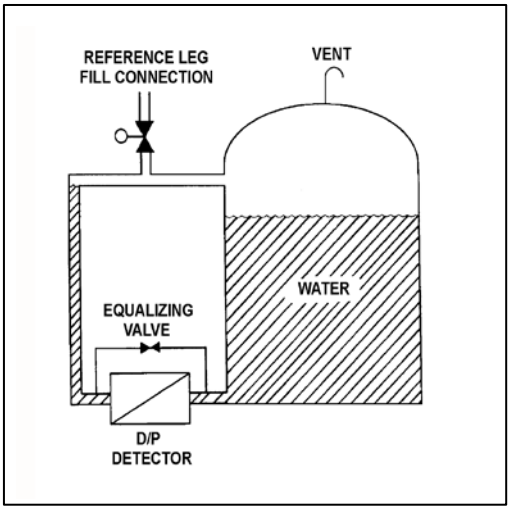
If the tank is completely filled with water, the tank level will indicate...

A. less than 30 feet.

B. 30 feet.

C. greater than 30 feet, but less than 40 feet.

D. 40 feet.



QUESTION: 6

A cooling water system pressure detector uses a bourdon tube as the sensing element. Which one of the following explains how the indicated system pressure will be affected if the temperature of the bourdon tube decreases by 30ºF? (Assume the cooling water system pressure does not change.)

A. Indicated pressure will decrease because the bourdon tube will become less flexible.

B. Indicated pressure will increase because the bourdon tube will become less flexible.

C. Indicated pressure will decrease because the bourdon tube internal pressure will decrease.

D. Indicated pressure will increase because the bourdon tube internal pressure will decrease.

QUESTION: 7

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32°F. The actual reference junction is located in a panel that is maintained at 120°F. Room temperature surrounding the panel is 80°F.

What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?

A. Add 48°F.

B. Subtract 48°F.

C. Add 88°F.

D. Subtract 88°F.

QUESTION: 8

Consider a direct-acting proportional flow controller that is maintaining flow rate at a value that is offset from the controller setpoint. If the controller's gain is decreased, the controller's offset will _____; and the controller's proportional band will _____.

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase

QUESTION: 9

An emergency diesel generator (DG) is operating as the only power source connected to an emergency bus. The governor of the DG is directly sensing DG _____ and will directly adjust DG _____ flow to maintain a relatively constant DG frequency.

A. speed; air

B. speed; fuel

C. load; air

D. load; fuel

QUESTION: 10

If a centrifugal pump is started with the discharge valve throttled versus fully open, the possibility of pump runout will _____; and the possibility of pump cavitation will _____.

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase

QUESTION: 11

Refer to the drawing of a centrifugal pump with a water storage tank for its suction source. The storage tank is open to the atmosphere and contains 20 feet of water at 60ºF. The pump is currently stopped.

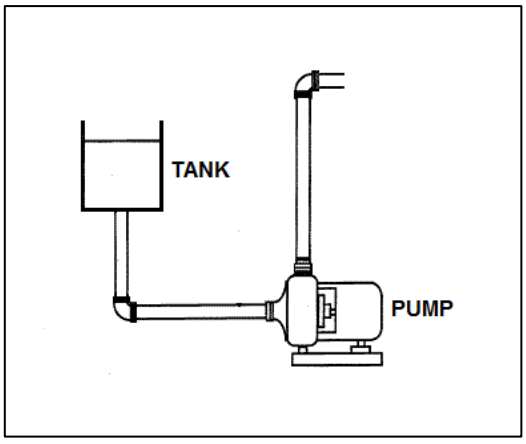
If the temperature of the water in the storage tank and pump suction piping increases to 80ºF, with the accompanying water expansion, the suction head for the pump will _____; and the available net positive suction head for the pump will _____.

A. increase; increase

B. increase; decrease

C. remain the same; increase

D. remain the same; decrease



QUESTION: 12

A centrifugal fire water pump takes suction from an open storage tank and discharges through a fire hose. Which one of the following will cause the pump to operate at shutoff head?

A. A firefighter inadvertently severs the fire hose.

B. The fire hose becomes partially crimped in a fire door.

C. Fire water storage tank level drops below the pump suction tap.

D. A firefighter adjusts the fire hose nozzle spray pattern from DELUGE to OFF.

QUESTION: 13

A pump is needed to supply fuel oil from a day tank to a diesel engine fuel injection system. The pump must maintain a nearly constant flow rate with a minimum of discharge pressure fluctuations as system pressure varies between 200 psig and 1,900 psig.

Which one of the following types of pumps would typically be used in this application?

A. Axial-flow centrifugal

B. Radial-flow centrifugal

C. Rotary positive displacement

D. Reciprocating positive displacement

QUESTION: 14

An AC induction motor is connected to a radial-flow centrifugal pump in a cooling water system. When the pump is started, the time period required to reach a stable running current will be shorter if the pump discharge valve is fully _____; and the stable running current will be lower if the pump discharge valve is fully _____.

A. open; open

B. open; closed

C. closed; open

D. closed; closed

QUESTION: 15

A main generator is connected to an infinite power grid with the following generator output parameters:

22 KV
60 Hertz
575 MW
100 MVAR (out)

Which one of the following contains a combination of minor adjustments to the main generator voltage regulator and speed control setpoints such that <u>each</u> adjustment will cause the main generator to operate at a power factor farther from 1.0? (Assume the generator power factor remains less than 1.0.)

	Voltage <u>Setpoint</u>	Speed <u>Setpoint</u>
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease

QUESTION: 16

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

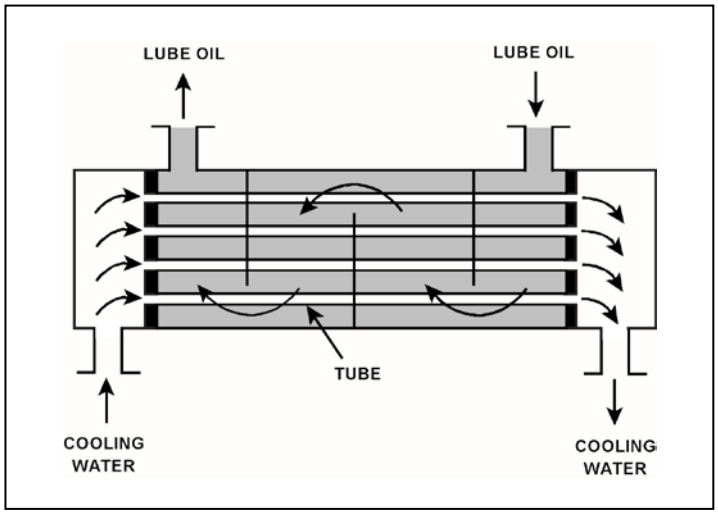
Assume that the inlet lube oil and inlet cooling water temperatures are constant and cooling water flow rate remains the same. Decreasing the oil flow rate through the heat exchanger will cause the lube oil outlet temperature to _____ and the cooling water outlet temperature to _____.

A. increase, increase

B. increase, decrease

C. decrease, increase

D. decrease, decrease



QUESTION: 17

The discharge valve for a large operating centrifugal pump should be positioned slowly to minimize the...

A. potential for causing water hammer.

B. change in available net positive suction head.

C. mechanical wear on the valve seat and stem packing.

D. differential pressure stress exerted on the valve disk and stem.

QUESTION: 18

A main turbine-generator is operating at 80 percent load with the following initial steady-state temperatures for the main turbine lube oil heat exchanger:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

After six months of main turbine-generator operation, the following final steady-state lube oil heat exchanger temperatures are observed:

$T_{oil\ in}$ = 179°F
$T_{oil\ out}$ = 119°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Assume the final cooling water and lube oil flow rates are the same as the initial flow rates, and the specific heat values for the cooling water and lube oil do not change.

Which one of the following could be responsible for the differences between the initial and final heat exchanger steady-state temperatures?

A. The heat exchanger tubes have become fouled with scale.

B. The temperature of the cooling water source has increased.

C. The final main turbine-generator load is higher than the initial load.

D. The final main turbine-generator load is lower than the initial load.

QUESTION: 19

The purpose of a mixed-bed demineralizer is to...

A. increase the conductivity of water with little effect on pH.

B. decrease the conductivity of water with little effect on pH.

C. increase the pH of water by reducing the number of positively charged ions in it.

D. decrease the pH of water by increasing the number of negatively charged ions in it.

QUESTION: 20

Which one of the following describes a possible cause and effect associated with a lower-than-normal differential pressure across a demineralizer during otherwise normal system flow conditions?

A. The resin has developed low resistance flow paths, which can decrease the decontamination factor for the demineralizer.

B. The resin has developed low resistance flow paths, which can increase the decontamination factor for the demineralizer.

C. The resin has become compacted, which can reduce the flow rate through the demineralizer and decrease the decontamination factor for the demineralizer.

D. The resin has become compacted, which can reduce the flow rate through the demineralizer and increase the decontamination factor for the demineralizer.

QUESTION: 21

Given the following indications for an open 4,160 VAC breaker:

All phase overcurrent trip flags are reset.
The control power fuses indicate blown.
The line-side voltmeter indicates 4,160 VAC.
The load-side voltmeter indicates 0 VAC.

Assuming no 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.

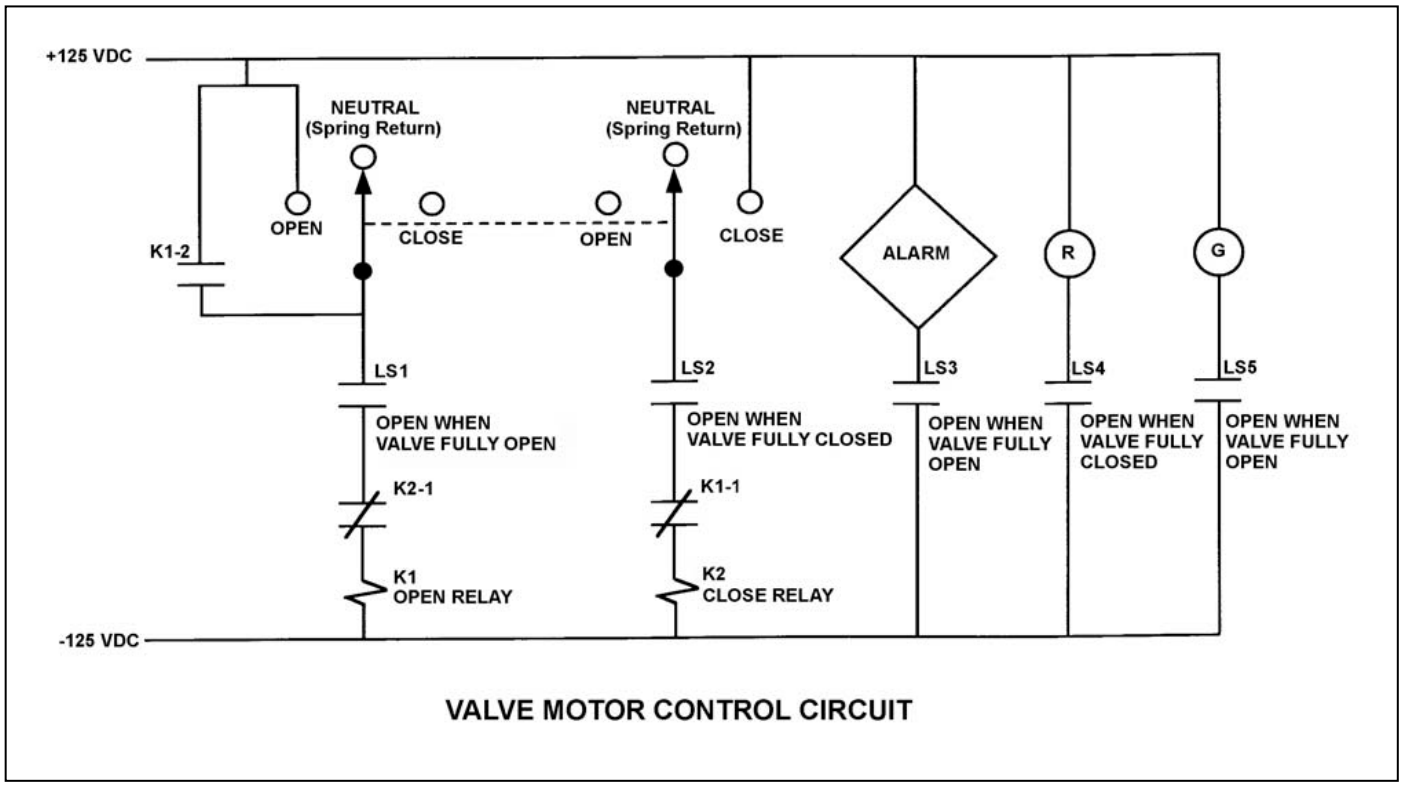
QUESTION: 22

Refer to the drawing of a valve motor control circuit (see figure below) for a valve that is currently fully open and has a 16-second stroke time.

Note: Limit switch (LS) contacts are shown open regardless of valve position, but relay contacts are shown open/closed according to the standard convention for control circuit drawings.

An operator takes the control switch to CLOSE. Two seconds later, after verifying the valve is closing, the operator releases the control switch. When the valve stops moving, what will be the status of the alarm and the red (R) and green (G) indicating lights?

	Alarm	Red Ind. Light	Green Ind. Light
A.	On	On	On
B.	On	Off	On
C.	Off	On	Off
D.	Off	Off	Off



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 23

During a brief time interval in a typical reactor operating steady-state near the beginning of a fuel cycle, 1.0×10^3 delayed neutrons were emitted.

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

A. 1.5×10^5

B. 6.5×10^6

C. 1.5×10^7

D. 6.5×10^8

QUESTION: 24

A reactor was initially shutdown at a stable power level of 2.0×10^{-5} percent. After a small positive reactivity addition, the current stable power level is 3.0×10^{-5} percent. If the initial K_{eff} was 0.982, what is the current K_{eff}?

A. 0.988

B. 0.992

C. 0.996

D. Cannot be determined without additional information.

QUESTION: 25

Two reactors are identical except that reactor A is near the end of core life and reactor B is near the beginning of core life. Both reactors are operating at 100 percent power when a reactor scram occurs at the same time on each reactor.

If no operator action is taken and the reactor systems for both reactors respond identically to the scram, a power level of 1.0×10^{-5} percent will be reached first by reactor _____ because it has the _____ effective delayed neutron fraction.

A. A; larger

B. B; larger

C. A; smaller

D. B; smaller

QUESTION: 26

How does control rod withdrawal affect the moderator temperature coefficient in an undermoderated reactor?

A. The initially positive MTC becomes less positive.

B. The initially positive MTC becomes more positive.

C. The initially negative MTC becomes less negative.

D. The initially negative MTC becomes more negative.

QUESTION: 27

Refer to the drawing of a curve showing the neutron absorption cross-section for U-238 at a resonance energy (see figure below). The reactor associated with the curve is operating at 80 percent power.

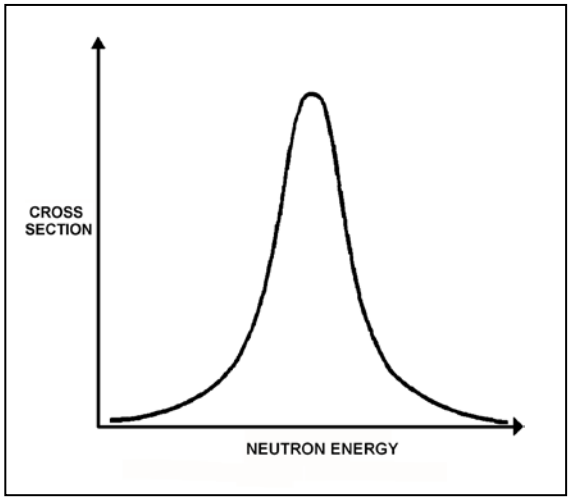
If reactor power is increased to 90 percent over the next few hours, the curve will become _____; and the percentage of the core neutron population lost to resonance capture by U-238 will _____.

A. shorter and broader; increase

B. shorter and broader; decrease

C. taller and more narrow; increase

D. taller and more narrow; decrease



QUESTION: 28

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

A. Increases continuously.

B. Decreases continuously.

C. Increases, then decreases.

D. Decreases, then increases.

QUESTION: 29

A reactor is operating at steady-state 100 percent power when a single control rod fully inserts (from the fully withdrawn position). The operator then returns the reactor to 100 percent power with the control rod still fully inserted.

Compared to the initial axial neutron flux shape, the current axial neutron flux shape will have a...

A. minor distortion, because a fully inserted control rod has zero reactivity worth.

B. minor distortion, because the fully inserted control rod is an axially uniform poison.

C. major distortion, because the upper and lower core halves are loosely coupled.

D. major distortion, because power production along the length of the rod drastically decreases.

QUESTION: 30

A reactor had been operating for two months at 100 percent power when a scram occurred. Fifteen hours later, during a reactor startup, the reactor has achieved criticality and reactor power is currently 1.0×10^{-4} percent.

Which one of the following describes the response of reactor power over the next 2 hours without any further operator actions?

A. Power increases toward the point of adding heat, due to the decay of Xe-135.

B. Power increases toward the point of adding heat, due to the decay of Sm-149.

C. Power decreases toward a stable shutdown neutron level, due to the buildup of Xe-135.

D. Power decreases toward a stable shutdown neutron level, due to the buildup of Sm-149.

QUESTION: 31

A reactor has been operating at steady-state 100 percent power for three weeks. The operator slowly adds negative reactivity over a period of 20 minutes to reduce reactor power to 90 percent.

Which one of the following describes reactor power 60 minutes after power level reaches 90 percent if no additional operator action is taken?

A. Greater than 90 percent and decreasing slowly.

B. Greater than 90 percent and increasing slowly.

C. Less than 90 percent and decreasing slowly.

D. Less than 90 percent and increasing slowly.

QUESTION: 32

Which one of the following contributes to the need for a much higher 100 percent power control rod density at the beginning of a fuel cycle (BOC) as compared to the end of a fuel cycle (EOC)?

A. The negative reactivity from burnable poisons is greater at BOC.

B. The negative reactivity from fission product poisons is smaller at BOC.

C. The positive reactivity from the fuel in the core is smaller at BOC.

D. The positive reactivity from a unit withdrawal of a typical control rod is greater at BOC.

QUESTION: 33

Which one of the following is a significant factor when calculating the critical rod position for a reactor startup?

A. Core flow rate

B. Source range initial count rate

C. Recirculation ratio

D. Core age

QUESTION: 34

Given:

- Reactors A and B are identical except that reactor A has an effective delayed neutron fraction of 0.0068 and reactor B has an effective delayed neutron fraction of 0.0052.
- Reactor A has a stable period of 45 seconds and reactor B has a stable period of 42 seconds.
- Both reactors are initially operating at 1.0×10^{-8} percent power.

The reactor that is supercritical by the greater amount of positive reactivity is reactor _____; and the first reactor to reach 1.0×10^{-1} percent power will be reactor _____.

A A; A

B. A; B

C. B; A

D. B; B

QUESTION: 35

During a reactor heatup, reactor pressure was increased from 5 psig to 50 psig in a 2-hour period. What was the average heatup rate?

A. 35°F/hr

B. 60°F/hr

C. 70°F/hr

D. 120°F/hr

QUESTION: 36

A nuclear power plant is initially operating at steady-state 60 percent power in the middle of a fuel cycle when a turbine control system malfunction closes the turbine steam inlet valves an additional 5 percent. Which one of the following describes the initial reactor power change and the cause for the power change?

A. Decrease, because the rate of neutron absorption in the moderator initially increases.

B. Decrease, because the rate of neutron absorption at U-238 resonance energies initially increases.

C. Increase, because the rate of neutron absorption in the moderator initially decreases.

D. Increase, because the rate of neutron absorption at U-238 resonance energies initially decreases.

QUESTION: 37

Refer to the drawing of two water storage tanks with four differential pressure (D/P) level detectors (see figure below).

The tanks are identical and are being maintained at 2 psig overpressure, 60°F, and the same constant water level. The tanks are located within a sealed containment structure that is being maintained at standard atmospheric pressure. All level detectors have been calibrated and are producing the same level indication.

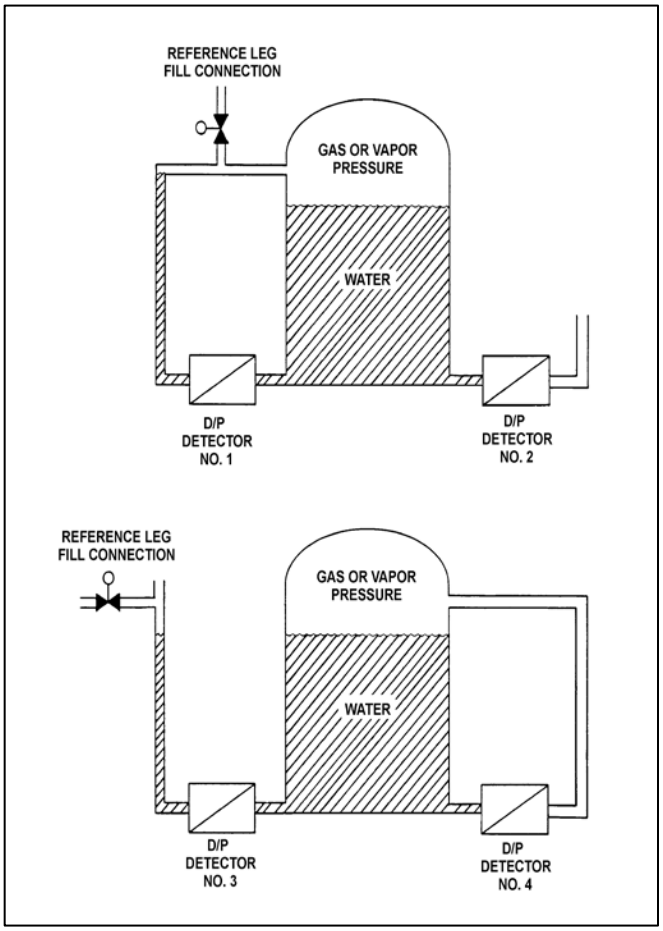
If a ventilation malfunction causes the containment structure pressure to decrease to 13 psia, which detectors will produce the highest level indications?

A. 1 and 2

B. 3 and 4

C. 1 and 4

D. 2 and 3



QUESTION: 38

What is the approximate quality of wet steam leaving a reactor at 530 psig with an enthalpy of 928.9 Btu/lbm?

A. 25 percent

B. 37 percent

C. 63 percent

D. 75 percent

QUESTION: 39

The steam inlet nozzles used in steam jet air ejectors convert the _____ of the steam into _____.

A. kinetic energy; pressure

B. enthalpy; kinetic energy

C. kinetic energy; velocity

D. enthalpy; pressure

QUESTION: 40

A nuclear power plant is initially operating at 85 percent reactor power when extraction steam to a high pressure feedwater heater is isolated. Main generator load is returned to its initial value. When the plant stabilizes, reactor power will be _____ than 85 percent; and the steam cycle thermal efficiency will be _____.

A. less; lower

B. less; higher

C. greater; lower

D. greater; higher

QUESTION: 41

If the quality of a flowing steam-water mixture is known, what additional information, if any, is needed to determine the percent moisture content of the steam-water mixture?

A. The mass flow rate of the mixture.

B. The specific volume of the mixture.

C. The pressure and/or temperature of the mixture.

D. No additional information is needed.

QUESTION: 42

Refer to the drawing of a venturi in a steam line (see figure below). The venturi inlet and outlet pipe diameters at P1 and P2 are equal.

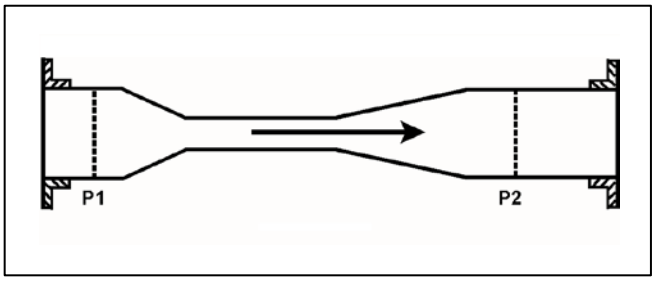
Currently, steam is flowing through the venturi, reaching sonic velocity in the throat of the venturi. If the steam inlet pressure (P1) remains constant while the downstream pressure (P2) decreases, the mass flow rate of the steam will _____; and the velocity of the steam at the venturi outlet will _____.

A. increase; increase

B. increase; remain the same

C. remain the same; increase

D. remain the same; remain the same



QUESTION: 43

Which one of the following has the highest thermal conductivity value?

A. Fuel pellet

B. Fuel clad

C. Fuel rod fill gas

D. Fission product gases

QUESTION: 44

How does the convective heat transfer coefficient vary from the bottom to the top of a fuel assembly if reactor coolant enters the fuel assembly as subcooled water and exits as superheated steam?

A. Increases continuously.

B. Increases, then decreases.

C. Decreases continuously.

D. Decreases, then increases.

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. Reactor pressure increases.

B. Recirculation flow rate increases.

C. Feedwater temperature decreases.

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 24 psig.
- Pressure at P_2 is 16 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 10 psig.

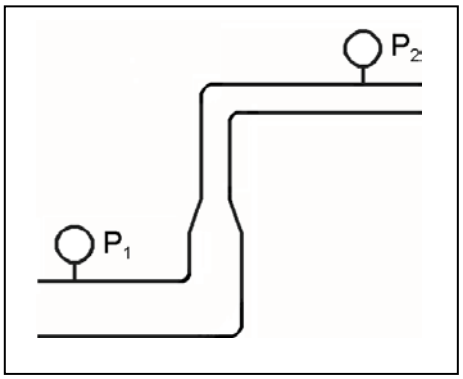
The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

A. 2 psig; left to right

B. 2 psig; right to left

C. 4 psig; left to right

D. 4 psig; right to left



QUESTION: 47

A reactor has been operating at 80 percent power for 2 weeks with 100 percent reactor recirculation flow rate. Control rods are withdrawn incrementally to raise reactor power to 85 percent. Which one of the following describes the effect of the reactor power increase on bundle critical power? (Assume the reactor recirculation flow rate and core neutron flux distribution remain the same.)

A. Bundle critical power increases as the bundle power increases.

B. Bundle critical power decreases as the bundle power increases.

C. Bundle critical power increases if the coolant entering the fuel bundle becomes more subcooled.

D. Bundle critical power decreases if the coolant entering the fuel bundle becomes more subcooled.

QUESTION: 48

A step increase in reactor power caused a fuel rod surface temperature increase from 570°F to 590°F at steady-state conditions. The fuel thermal time constant is 6 seconds.

Which one of the following was the approximate fuel rod surface temperature 6 seconds after the power change?

A. 574°F

B. 577°F

C. 580°F

D. 583°F

QUESTION: 49

Gross fuel cladding failure during a design basis loss of coolant accident is prevented by adhering to the...

A. linear heat generation rate limit.

B. maximum average planar linear heat generation rate limit.

C. minimum critical power ratio limit.

D. preconditioning interim operating management recommendations.

QUESTION: 50

Two identical reactors have been in operation for the last 10 years. Reactor A has experienced 40 heatup/cooldown cycles with an average power capacity of 50 percent. Reactor B has experienced 30 heatup/cooldown cycles with an average power capacity of 60 percent.

Which reactor will have the lower reactor vessel nil-ductility transition temperature, and why?

A. Reactor A, due to the lower average power capacity.

B. Reactor A, due to the greater number of heatup/cooldown cycles.

C. Reactor B, due to the higher average power capacity.

D. Reactor B, due to the fewer number of heatup/cooldown cycles.

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

JUNE 2014 NRC GENERIC FUNDAMENTALS EXAMINATION
BOILING WATER REACTOR - ANSWER KEY

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