UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
MARCH 2009 -- 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 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 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 copy and the 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

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

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

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

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

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

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

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

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

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

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

$E = IR$

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 = 3.41×10^6 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

A completely full water storage tank is being hydrostatically tested to 100 psig using a positive displacement pump (PDP) with a smooth and constant discharge flow rate of 10 gpm. The tank is protected by a safety valve and a relief valve; both valves will discharge to the atmosphere. Each valve has an opening setpoint of 105 psig and a maximum rated discharge flow rate of 6 gpm. The PDP is inadvertently left running when tank pressure reaches 100 psig.

With the PDP still running, tank pressure will stabilize _____ 105 psig; the greater mass flow rate will be coming from the _____ valve.

A. at; safety

B. above; safety

C. at; relief

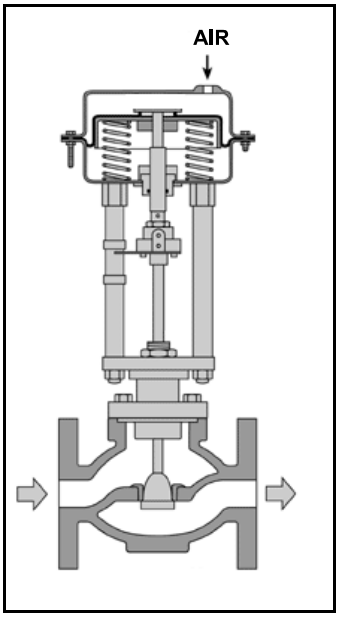
D. above; relief

QUESTION: 2

Refer to the drawing of a pneumatically-operated valve (see figure below). The valve actuator may be shown with or without applied air pressure.

Which one of the following describes the type of valve shown, and the fail position on loss of air to the actuator?

	Valve Type	Fail Position
A.	Ball	Open
B.	Ball	Closed
C.	Globe	Open
D.	Globe	Closed



QUESTION: 3

Which one of the following is a generally accepted method for locally verifying that a manual valve is fully closed in a depressurized static piping system?

A. Check a downstream flow gauge to be indicating zero flow.

B. Visually observe the valve rising-stem threading to be fully exposed.

C. Attempt to turn the valve handwheel in the close direction and verify no movement.

D. Compare an upstream and downstream pressure gauge to ensure zero differential pressure.

QUESTION: 4

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below).

Three separate bellows differential pressure flow detectors are connected to taps A, B, C, and D as follows:

Detector	Taps
X	A and D
Y	B and D
Z	C and D

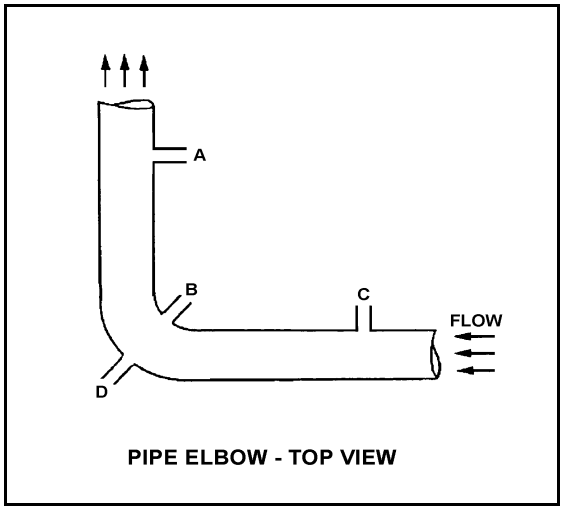
Assuming zero head loss in this section of pipe, how will the detectors be affected if tap D ruptures?

A. All detectors will fail low.

B. All detectors will fail high.

C. Two detectors will fail low and one will fail high.

D. Two detectors will fail high and one will fail low.



PIPE ELBOW - TOP VIEW

QUESTION: 5

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

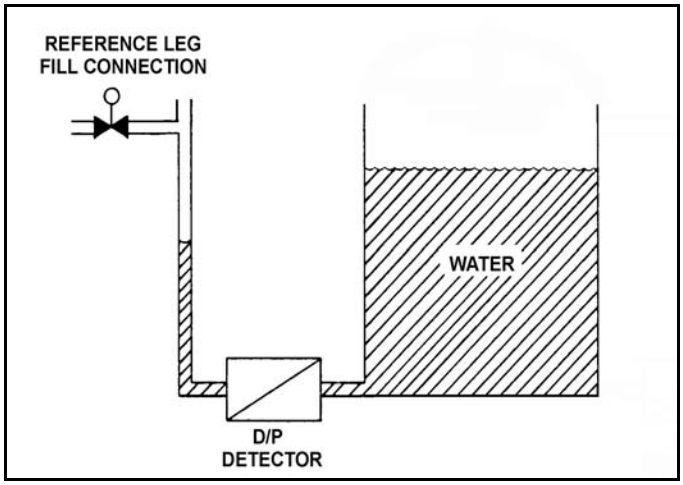
The level instrument has just been calibrated to indicate actual tank water level. Assume that tank water temperature and level remain constant. If the reference leg temperature increases by 20°F, indicated tank water level will...

A. be unpredictable.

B. equal the actual level.

C. read less than the actual level.

D. read greater than the actual level.



QUESTION: 6

In contrast to a thermocouple, a resistance temperature detector...

A. is used in high temperature applications.

B. does not require an external power supply for temperature indication.

C. uses a single type of metal or alloy in the sensing element.

D. is commonly placed in direct contact with the monitored substance.

QUESTION: 7

A fission chamber used for reactor neutron monitoring is operating in the ionization region. If the voltage supplied to the fission chamber is continuously increased, which one of the following operating regions will the detector enter next?

A. Proportional

B. Recombination

C. Geiger-Mueller

D. Limited proportional

QUESTION: 8

Refer to the drawing of a lube oil temperature control system (see figure below).

The temperature controller is a direct-acting proportional controller. Assume the measured temperature remains within the controller's proportional band.

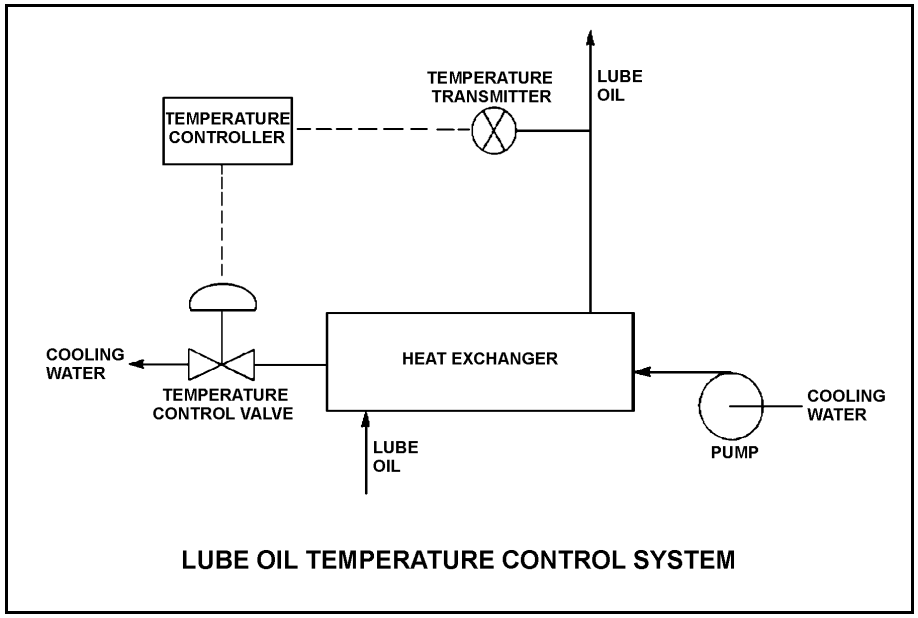
Which one of the following describes the effect of changing the controller's gain from 1.0 to 2.0?

A. Half the change in measured temperature will produce the same change in controller input.

B. Twice the change in measured temperature will produce the same change in controller input.

C. The temperature control valve will move half as far for the same change in controller input.

D. The temperature control valve will move twice as far for the same change in controller input.



LUBE OIL TEMPERATURE CONTROL SYSTEM

QUESTION: 9

Refer to the drawing of a flyball-weight mechanical speed governor (see figure below).

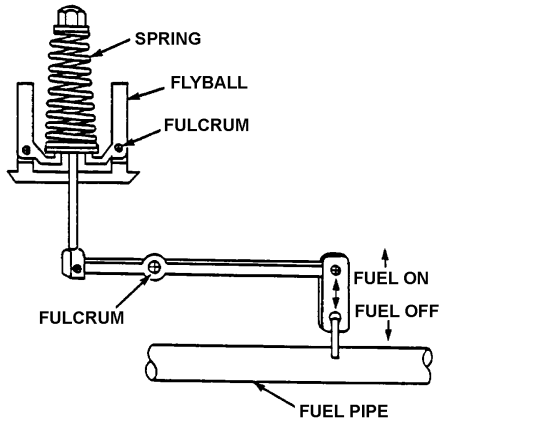
In a flyball-weight mechanical speed governor, the purpose of the spring on the flyball mechanism is to _____ centrifugal force by driving the flyballs _____.

A. counteract; outward

B. aid; inward

C. counteract; inward

D. aid; outward



FLYBALL-WEIGHT MECHANICAL SPEED GOVERNOR

QUESTION: 10

A centrifugal pump is operating with the following parameters:

Pump head: 50 psid
Flow rate: 200 gpm
Power input: 3 KW

Pump speed is increased and flow rate increases to 400 gpm. Which one of the following is the value of the new power consumption?

A. 6 KW

B. 9 KW

C. 24 KW

D. 27 KW

QUESTION: 11

Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).

Given the following initial conditions:

- Condenser pressure is 1.2 psia.
- Condensate temperature is 96°F.
- Hotwell level is 10 feet above the condensate pump suction.

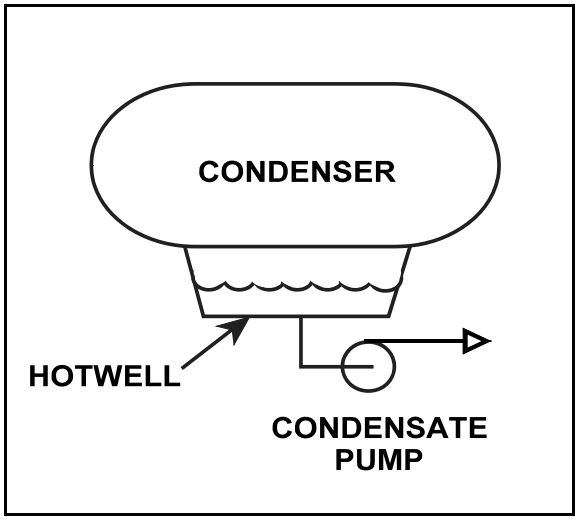
Which one of the following will provide the greatest increase in NPSH available to the condensate pump? (Assume that condenser pressure does not change.)

A. Hotwell level decreases by 6 inches.

B. Hotwell level increases by 6 inches.

C. Condensate temperature decreases by 6°F.

D. Condensate temperature increases by 6°F.



QUESTION: 12

Refer to the drawing of a lube oil temperature control system and the associated centrifugal pump operating curve (see figure below).

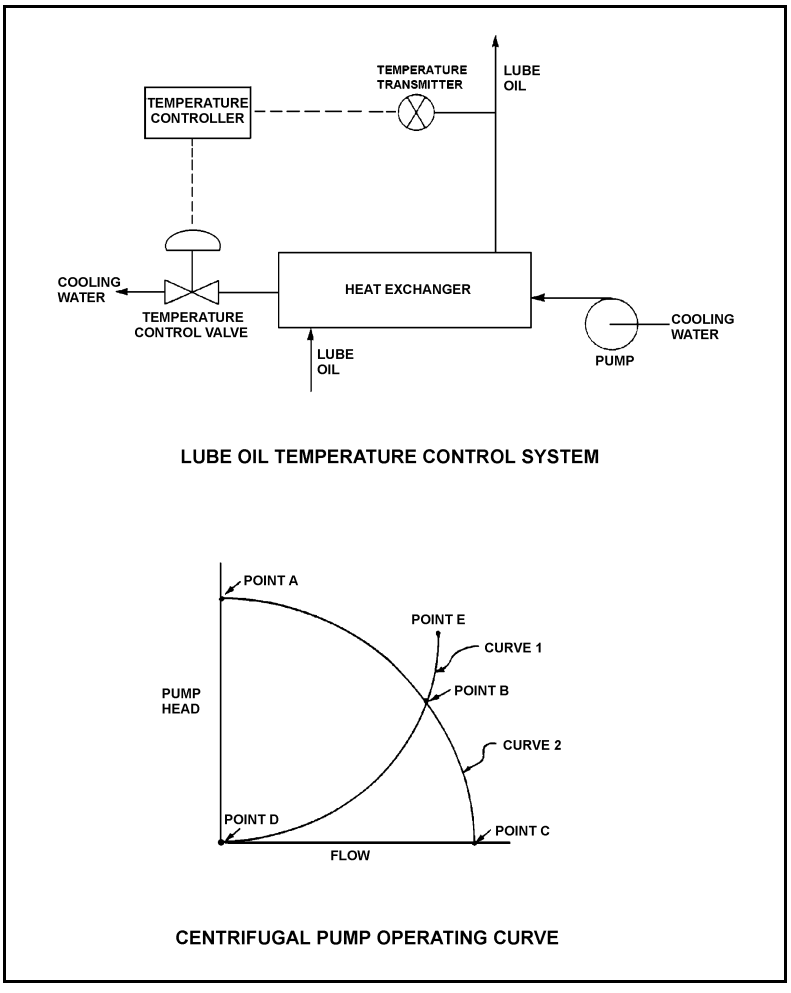
If the pump is operating at point B, how will the operating point change if the temperature controller setpoint is decreased by 10°F?

A. Operating point B will be located on curve 1 closer to point E.

B. Operating point B will be located on curve 1 closer to point D.

C. Operating point B will be located on curve 2 closer to point A.

D. Operating point B will be located on curve 2 closer to point C.



QUESTION: 13

Prior to starting a positive displacement pump, the discharge valve should be open to...

A. prevent rupturing the pump casing.

B. limit the pump motor starting time.

C. ensure the pump casing fills by backflow.

D. reduce pressure fluctuations in the discharge piping.

QUESTION: 14

When a motor-driven centrifugal pump is started, the motor ammeter reading immediately increases to, and stabilizes at, many times the normal operating value. Which one of the following describes a possible cause for the ammeter response?

A. The pump was started with a fully closed discharge valve.

B. The pump was started with a fully open discharge valve.

C. The pump shaft seized upon start and did not rotate.

D. The pump shaft separated from the motor shaft upon start.

QUESTION: 15

A large centrifugal pump is driven by a 200 horsepower 4.16 KV ac motor. The motor breaker control circuit contains the following protection devices: instantaneous overcurrent relay, motor thermal overload relay, control power fuses, and an anti-pumping device.

The pump had been manually started and stopped several times during a 5-minute period when the motor breaker unexpectedly tripped. In this situation, which one of the following is the most likely cause of the breaker trip?

A. Instantaneous overcurrent

B. Motor thermal overload

C. Blown control power fuse

D. Anti-pumping device actuation

QUESTION: 16

Which one of the following describes the proper sequence for placing a steam (shell) and water (tube) heat exchanger into service?

A. The water side is valved in before the steam side to minimize thermal shock.

B. The water side is valved in before the steam side to ensure adequate venting.

C. The steam side is valved in before the water side to minimize scale buildup on the heat exchanger tubes.

D. The steam side is valved in before the water side to ensure that the cooldown rate does not exceed 100°F/hr.

QUESTION: 17

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

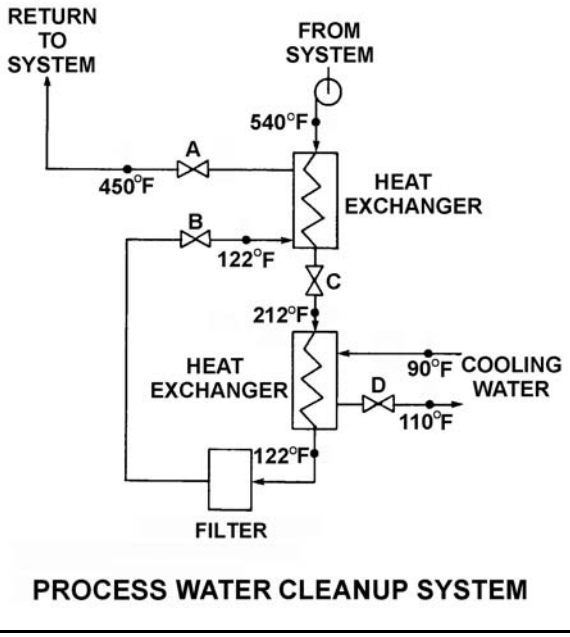
Assume there is no heat loss from the process water cleanup system to the surroundings and the process water flow rate does not change. If valve D closes fully, what will be the final steady-state temperature of the process water flowing through the filter?

A. 212°F

B. 302°F

C. 450°F

D. 540°F



PROCESS WATER CLEANUP SYSTEM

QUESTION: 18

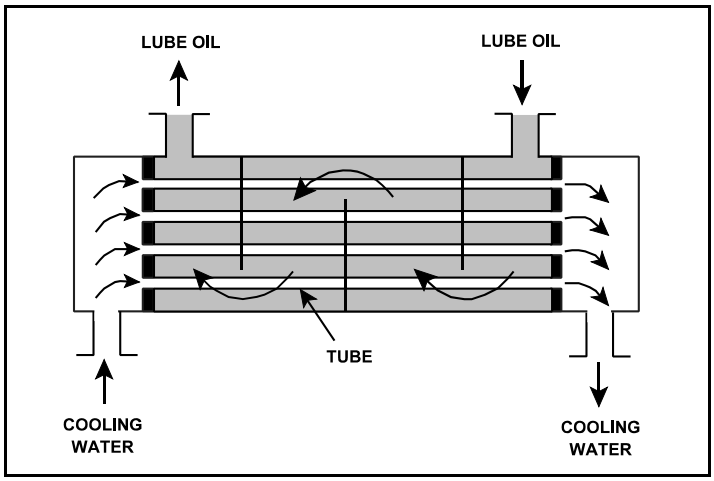
Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 130°F
Cooling water inlet temperature: 70°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following sets of heat exchanger outlet temperatures is possible? (Assume both fluids have the same c_p.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	100°F
B.	90°F	110°F
C.	100°F	100°F
D.	100°F	110°F



QUESTION: 19

A condensate demineralizer differential pressure (D/P) gauge indicates 4.0 psid at 50% flow rate. Which one of the following combinations of condensate flow and demineralizer D/P observed at various power levels over the next few days indicates an increase in the accumulation of insoluble corrosion products in the demineralizer?

	Condensate Flow Rate	Demineralizer D/P (psid)
A.	25%	0.9
B.	60%	6.3
C.	75%	8.7
D.	100%	15.6

QUESTION: 20

Water is passing through an ion exchanger that contains only anion exchange resin. Currently, every available ion exchange site in the resin has exchanged its original anion and is occupied by a chloride (Cl^-) anion. Assuming that water temperature does not change, what will be the effect on the ion exchanger if a new anion impurity is introduced into the water entering the ion exchanger?

A. The new anions will bypass the occupied ion exchange sites under all circumstances.

B. The new anions will take the place of the Cl^- anions on the ion exchange sites under all circumstances.

C. The new anions will take the place of the Cl^- anions on the ion exchange sites only if the new anions have a greater negative charge than the Cl^- anions.

D. The new anions will take the place of the Cl^- anions on the ion exchange sites only if the new anions have a greater affinity for the anion exchange resin.

QUESTION: 21

A typical 120 VAC manual circuit breaker has tripped due to overload. To close this circuit breaker the handle must be moved from the...

A. OFF position directly to the ON position; trip latch reset is not required.

B. midposition directly to the ON position; trip latch reset is not required.

C. OFF position to the midposition to reset the trip latch, and then to the ON position.

D. midposition to the OFF position to reset the trip latch, and then to the ON position.

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 10-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.

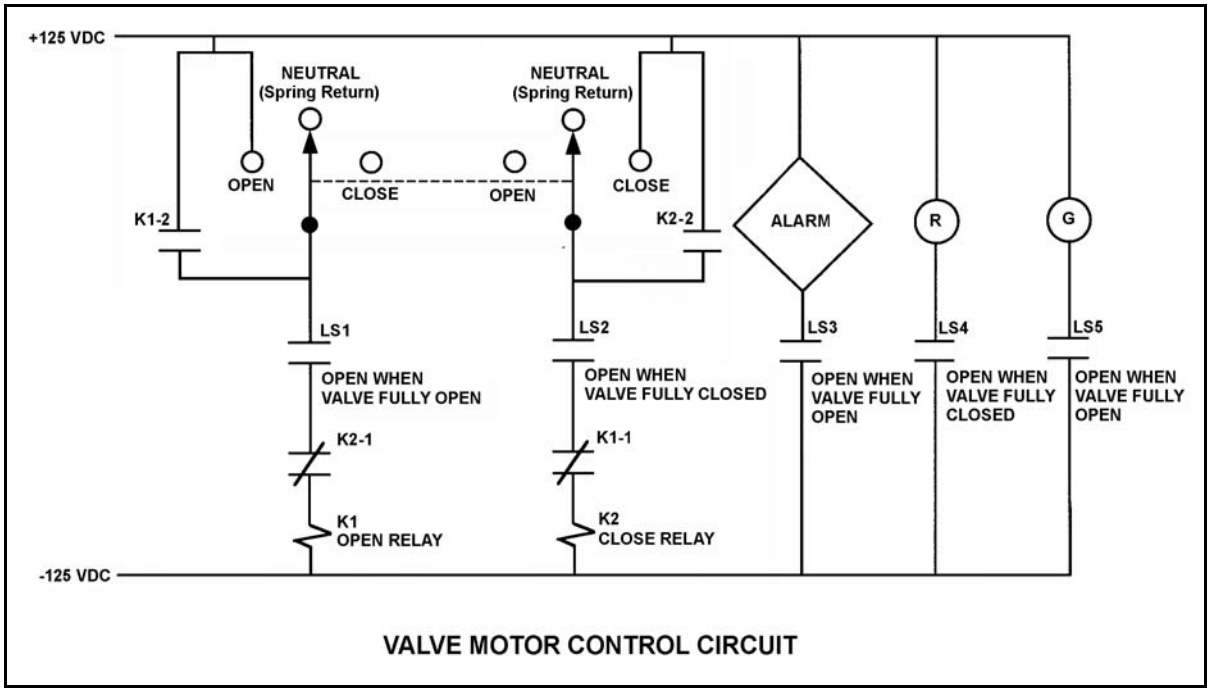
The operator takes the control switch to "Close" momentarily and the valve begins to close. Five seconds later, the operator takes the switch to "Open" momentarily and then releases the switch. Which one of the following describes the valve response after the switch is released?

A. The valve will stop closing and remain partially open.

B. The valve will stop closing and then go fully open.

C. The valve will close fully and remain fully closed.

D. The valve will close fully and then go fully open.



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 23

Neutron moderation describes...

A. a decrease in the core neutron population from thermal neutron absorption.

B. an increase in the neutron multiplication factor due to a reduction in neutron poisons.

C. the loss of fission neutrons from the core by leakage.

D. the reduction of neutron energy due to scattering reactions.

QUESTION: 24

A thermal neutron is about to interact with a U-238 nucleus in an operating nuclear reactor core. Which one of the following describes the most likely interaction and the effect on core K_{eff}?

A. The neutron will be scattered, thereby leaving K_{eff} unchanged.

B. The neutron will be absorbed and U-238 will undergo fission, thereby decreasing K_{eff}.

C. The neutron will be absorbed and U-238 will undergo fission, thereby increasing K_{eff}.

D. The neutron will be absorbed and U-238 will undergo radioactive decay to Pu-239, thereby increasing K_{eff}.

QUESTION: 25

A reactor is initially critical below the point of adding heat (POAH) and remains below the POAH. Consider the following two cases:

Case 1: An operator adds positive 1.0×10^{-4} $\Delta K/K$ reactivity to the reactor.
Case 2: An operator adds negative 1.0×10^{-4} $\Delta K/K$ reactivity to the reactor.

The time required for reactor power to change by a factor of 10 will be greater in case ___ because delayed neutrons are more effective at slowing reactor power changes when reactor power is _____.

A. 1; increasing

B. 1; decreasing

C. 2; increasing

D. 2; decreasing

QUESTION: 26

A nuclear power plant is being returned to operation following a one-month refueling outage. Fuel preconditioning requires reactor power to be increased from 10% to 100% power gradually over an 8 hour period.

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

A. fuel burnup.

B. xenon buildup.

C. fuel temperature increase.

D. moderator temperature increase.

QUESTION: 27

Which one of the following will cause the void coefficient to become less negative? (Consider only the direct effects of the indicated changes.)

A. Core void fraction increases.

B. Fuel temperature decreases.

C. Gadolinium burns out.

D. Control rods are partially inserted.

QUESTION: 28

Rod position indication shows that a control rod is at position 22. If the control rod is then moved to position 12, it is being...

A. inserted 30 inches.

B. withdrawn 30 inches.

C. inserted 60 inches.

D. withdrawn 60 inches.

QUESTION: 29

A nuclear reactor is operating at 85% power with control rod X-Y inserted 20%. Which one of the following will cause the differential control rod worth of control rod X-Y to become more negative? (Assume that control rod X-Y remains 20% inserted for each case.)

A. Core Xe-135 builds up in the lower half of the core.

B. An adjacent control rod is fully withdrawn from the core.

C. Reactor vessel pressure drifts from 900 psig to 880 psig.

D. Fuel temperature increases as fission product gases accumulate in nearby fuel rods.

QUESTION: 30

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

Which reactor core has the greater <u>concentration</u> of Xe-135?

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

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

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

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

QUESTION: 31

Which one of the following explains why core Xe-135 oscillations are a concern in a nuclear reactor?

A. They can adversely affect core power distribution and they can require operation below full rated power.

B. They can adversely affect core power distribution and they can prevent reactor criticality during a reactor startup.

C. They can cause excessively short reactor periods during power operation and they can require operation below full rated power.

D. They can cause excessively short reactor periods during power operation and they can prevent reactor criticality during a reactor startup.

QUESTION: 32

Burnable poisons are placed in a nuclear reactor core to...

A. increase the amount of fuel that can be loaded into the core.

B. accommodate control rod depletion that occurs over core life.

C. compensate for the buildup of xenon-135 that occurs over core life.

D. ensure that the reactor will always operate in an undermoderated condition.

QUESTION: 33

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

At this time, which one of the following will cause the fission rate in the reactor core to decrease?

A. Core void fraction is decreased by 2%.

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 two hours is allowed to pass with no other changes in plant parameters.

QUESTION: 34

After taking critical data during a reactor startup, the operator establishes a stable 50-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.006$.)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

QUESTION: 35

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

A. 3% power to 10% power

B. 10% power to 15% power

C. 15% power to 30% power

D. 30% power to 40% power

QUESTION: 36

A nuclear reactor is critical just below the point of adding heat when an inadvertent reactor scram occurs. All control rods fully insert except for one rod, which remains fully withdrawn. Five minutes after the reactor scram, with reactor period stable at approximately negative (-) 80 seconds, the remaining withdrawn control rod suddenly and rapidly fully inserts.

Which one of the following describes the reactor response to the insertion of the last control rod?

A. The negative period will remain stable at approximately -80 seconds.

B. The negative period will immediately become shorter, and then lengthen and stabilize at approximately -80 seconds.

C. The negative period will immediately become shorter, and then lengthen and stabilize at a value more negative than -80 seconds.

D. The negative period will immediately become shorter, and then lengthen and stabilize at a value less negative than -80 seconds.

QUESTION: 37

Refer to the drawing of four identical tank differential pressure (D/P) level detectors with different piping configurations (see figure below).

The tanks are identical and are presently at 2 psig overpressure, the same constant water level, and a temperature of 60°F. They are surrounded by atmospheric pressure. All level detectors have been calibrated and are producing the same level indication. A leak in the top of each tank causes a complete loss of overpressure in both tanks.

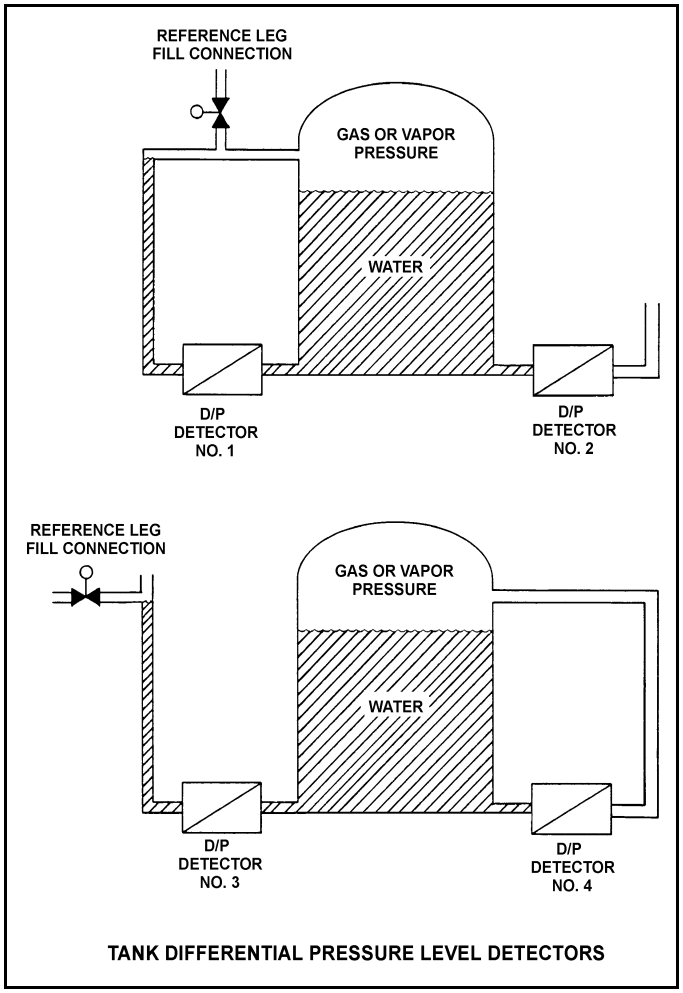
Which level detector(s) will produce the highest level indication?

A. No. 1 only

B. No. 2 only

C. No. 1 and 4

D. No. 2 and 3



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

QUESTION: 38

What happens to the enthalpy of the saturated steam in a reactor vessel (RV) as heat addition to the feedwater increases RV pressure from 100 psia to 1,000 psia?

A. The enthalpy increases during the entire pressure increase.

B. The enthalpy initially increases and then decreases.

C. The enthalpy decreases during the entire pressure increase.

D. The enthalpy initially decreases and then increases.

QUESTION: 39

A nuclear power plant is operating at 80% power with 5°F of condensate depression in the main condenser. If the condensate depression decreases to 2°F, the steam cycle thermal efficiency will _____ and the condensate pumps will operate _____cavitation.

A. increase; closer to

B. increase; farther from

C. decrease; closer to

D. decrease; farther from

QUESTION: 40

A nuclear power plant is operating steady-state at 85% of rated power when the extraction steam to a high-pressure feedwater heater is isolated. Which one of the following describes the initial effect on main turbine- generator output (MWe)? (Assume no operator action and no reactor protection actuation.)

A. MWe increases because plant efficiency increases.

B. MWe decreases because plant efficiency decreases.

C. MWe increases because the total steam flow rate through the turbine increases.

D. MWe decreases because the total steam flow rate through the turbine decreases.

QUESTION: 41

An ideal positive displacement pump is pumping to a system operating at 100 psig. Assume pump speed is constant, zero pump slip, and pump backpressure remains within normal pump operating limits.

If system pressure increases to 200 psig, the pump head will _____; and pump flow rate will _____.

A. increase; remain the same

B. increase; decrease

C. remain the same; remain the same

D. remain the same; decrease

QUESTION: 42

A vented water storage tank contains 64 feet of water at 70°F. A cracked weld at the bottom of the tank results in a leak rate of 12 gpm. At what water level will the leak rate be 3 gpm?

A. 48 feet

B. 32 feet

C. 16 feet

D. 4 feet

QUESTION: 43

Which one of the following is the most accurate indication of mass flow rate through a nuclear reactor for calculating core thermal power during reactor power operation?

A. Core flow rate

B. Steam flow rate

C. The sum of feed water and control rod drive flow rates

D. The sum of both recirculation loop flow rates

QUESTION: 44

A nuclear power plant is currently shut down 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 an upward 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: 45

How does critical heat flux vary from the bottom to the top of a typical fuel bundle during normal full power operation?

A. Decreases continuously.

B. Decreases, then increases.

C. Increases continuously.

D. Increases, then decreases.

QUESTION: 46

Which one of the following values approximates the quality of the saturated steam/water mixture leaving the core at 948 psig and 905 Btu/lbm?

A. 27%

B. 44%

C. 56%

D. 73%

QUESTION: 47

A nuclear power plant is operating at 90% power near the end of a fuel cycle when the turbine control system opens the turbine control valves an additional 5 percent. Assuming the reactor does not scram immediately, critical power ratio will initially _____ due to a(n) _____ latent heat of vaporization.

A. decrease; decreased

B. decrease; increased

C. increase; decreased

D. increase; increased

QUESTION: 48

The fuel thermal time constant specifies the amount of time required for...

A. a fuel bundle to achieve equilibrium temperature following a power change.

B. a fuel pellet to achieve equilibrium temperature following a power change.

C. the fuel centerline temperature to undergo most of its total change following a power change.

D. the fuel cladding temperature to undergo most of its total change following a power change.

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 nuclear reactors are currently shut down for refueling. Reactor A has achieved an average lifetime power capacity of 60% while operating for 15 years. Reactor B has achieved an average lifetime power capacity of 60% while operating for 12 years.

Which reactor, if any, will have the lower reactor vessel nil ductility transition temperature?

A. Reactor A because it has produced more total fissions.

B. Reactor B because it has produced less total fissions.

C. Both reactors will have approximately the same nil ductility transition temperature because they have equal average lifetime power capacities.

D. Both reactors will have approximately the same nil ductility transition temperature because the fission rate in a shut down core is not significant.

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

MARCH 2009 NRC GENERIC FUNDAMENTALS EXAMINATION
BOILING WATER REACTOR - ANSWER KEY

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