UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2015 – 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. pressurized water reactor (PWR) nuclear power plant.

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

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

_____

Applicant's Signature

RULES AND 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

---

1 MW $= 3.41 \times 10^6$ Btu/hr

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

1 Btu $= 778$ ft-lbf

$℃ = (5/9)(°F - 32)$

$°F = (9/5)(℃) + 32$

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 main steam system uses a combination of safety and relief valves for overpressure protection. Which one of the following describes a major design consideration for installing both types of valves in the same system?

A. The safety valves are installed to prevent chattering of the relief valves during normal power operation.

B. The safety valves are installed to prevent unnecessary opening of the relief valves during a steam pressure transient.

C. The relief valves are installed to prevent chattering of the safety valves during normal power operation.

D. The relief valves are installed to prevent unnecessary opening of the safety valves during a steam pressure transient.

QUESTION: 2

In a comparison between butterfly valves and ball valves, _____ valves are generally more leak-tight in high pressure applications; and _____ valves generally exhibit the smaller pressure decrease when fully open.

A. ball; ball

B. ball; butterfly

C. butterfly; ball

D. butterfly; butterfly

QUESTION: 3

Refer to the drawing of a frictionless venturi flow element (see figure below). Subcooled water is flowing through the venturi with the following initial conditions:

Flow rate = 500 gpm
Tap A pressure = 48 psia
Tap B pressure = 44 psia

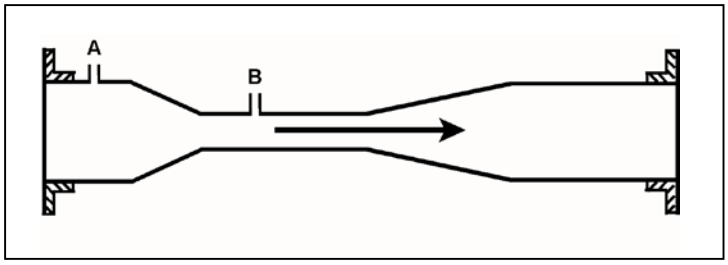
When flow rate is increased to 900 gpm, the pressure at tap A increases to 62 psia. What is the new pressure at tap B?

A. 46 psia

B. 49 psia

C. 55 psia

D. 60 psia



QUESTION: 4

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

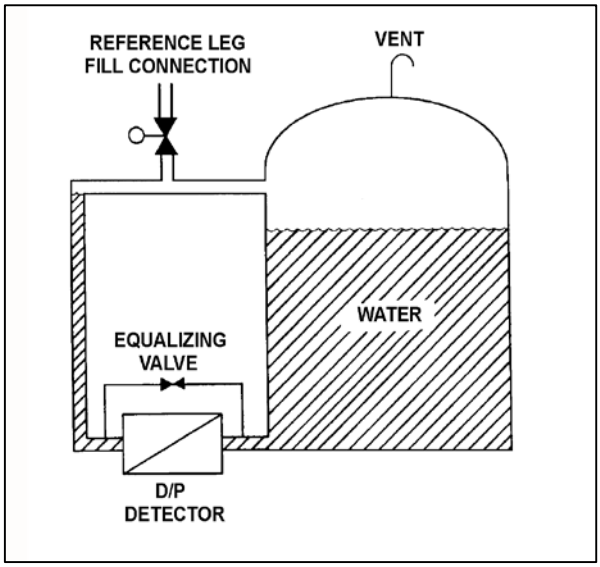
The level detector is being used in a level control system that was calibrated to maintain tank level at 80 percent when the tank water temperature was 100°F. If tank water temperature gradually increases and stabilizes at 150°F, the level control system will cause actual tank level to...

A. remain stable at 80 percent.

B. increase and stabilize above 80 percent.

C. oscillate and then stabilize at 80 percent.

D. decrease and stabilize below 80 percent.



QUESTION: 5

A simple two-wire resistance temperature detector (RTD) is being used to measure the temperature of a water system. Copper extension wires run from the RTD to a temperature instrument 40 feet away. If the temperature of the extension wires decreases, the electrical resistance of the extension wires will _____; and the temperature indication will _____ unless temperature compensation is provided.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 6

A reactor is shut down at 100 cps in the source range when a loss of coolant accident occurs. Assuming the source neutron production rate remains constant, how and why will excore source range detector outputs change as homogeneous core voiding increases from 20 percent to 40 percent?

A. Increases, because more neutron leakage is occurring.

B. Decreases, because less neutron leakage is occurring.

C. Increases, because K_{eff} is increasing.

D. Decreases, because K_{eff} is decreasing.

QUESTION: 7

An air-operated isolation valve requires 3,600 pounds-force applied to the top of the actuator diaphragm to open. The actuator diaphragm has a diameter of 9 inches and the valve stem travels 3 inches from fully open to fully closed.

If control air pressure to the valve actuator begins to increase from 0 psig, which one of the following is the approximate air pressure at which the valve will begin to open?

A. 14 psig

B. 57 psig

C. 81 psig

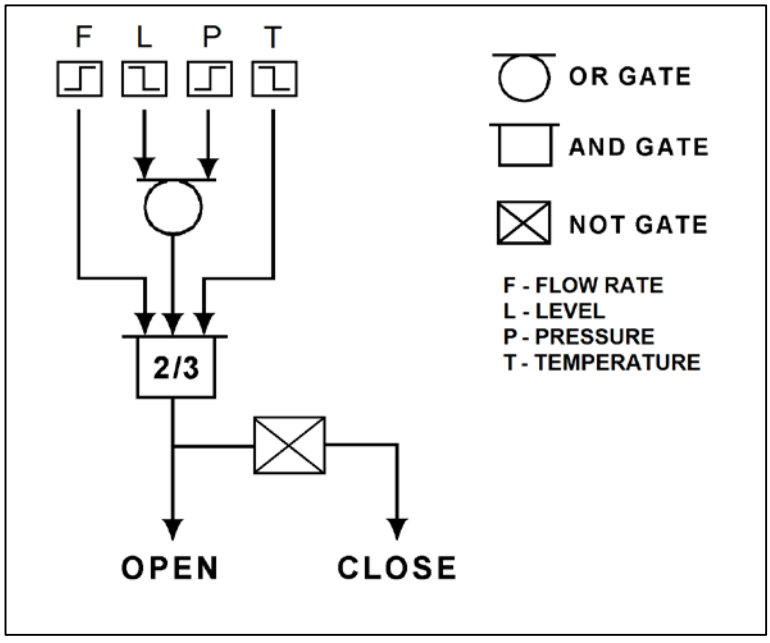
D. 127 psig

QUESTION: 8

Refer to the logic diagram for a valve controller (see figure below).

Which one of the following combinations of flow rate (F), level (L), pressure (P), and temperature (T) inputs will result in the valve receiving a CLOSE signal? (The options below indicate whether the parameters are higher or lower than the associated bistable setpoints.)

	INPUTS			
	F	L	P	T
A.	Higher	Higher	Lower	Higher
B.	Lower	Lower	Higher	Lower
C.	Higher	Lower	Lower	Higher
D.	Lower	Higher	Higher	Lower



QUESTION: 9

Given:

- A direct-acting proportional pneumatic controller will be used to maintain level in a condensate collection tank by positioning an air-operated flow control valve in the tank's drain line.
- The controller's input will vary directly with tank condensate level.

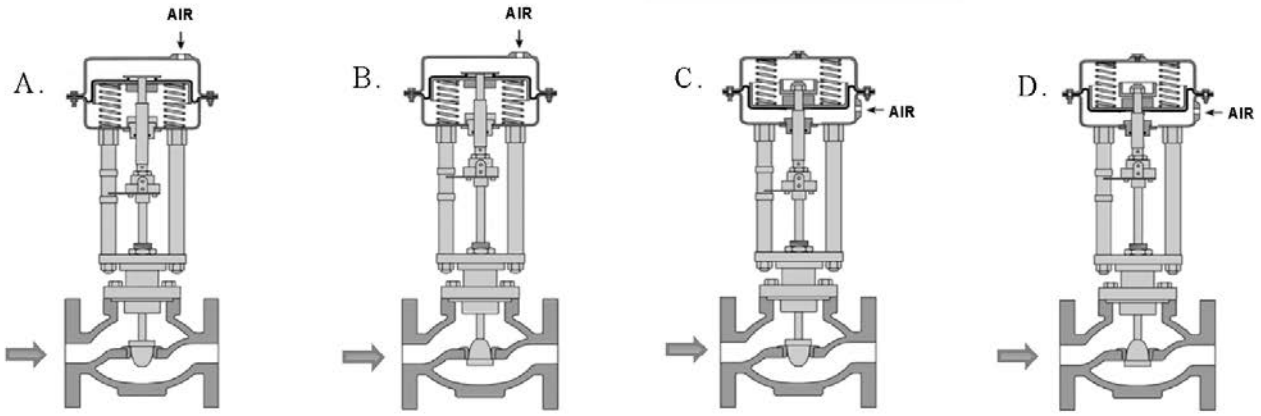
Which pair of flow control valves shown below will be compatible with the controller in the above application?

A. A and B

B. B and C

C. C and D

D. D and A



QUESTION: 10

A nuclear power plant is operating at full power when a 200 gpm reactor coolant leak occurs, which results in a reactor scram and initiation of emergency coolant injection. Reactor vessel pressure stabilizes at 900 psia. All centrifugal injection pumps are operating with all pump miniflow paths isolated. The shutoff heads for the pumps are as follows:

High pressure coolant injection (HPCI) pumps = 1,200 psia
Low pressure coolant injection (LPCI) pumps = 200 psia

If the injection pumps continue operating under these conditions, which pumps are more likely to fail, and why?

A. LPCI pumps, due to pump overheating.

B. LPCI pumps, due to motor overheating.

C. HPCI pumps, due to pump overheating.

D. HPCI pumps, due to motor overheating.

QUESTION: 11

A centrifugal pump is operating normally in a closed cooling water system. If system pressure is increased by 10 psi, the available net positive suction head (NPSH) for the pump will _____; and the pump mass flow rate will _____. (Assume the water density does not change and the minimum required NPSH for the pump is maintained.)

A. increase; increase

B. increase; remain the same

C. decrease; decrease

D. decrease; remain the same

QUESTION: 12

A centrifugal pump is operating at maximum design flow rate, taking suction on a vented water storage tank and discharging through two parallel valves. Valve A is fully open and valve B is half open.

Which one of the following will occur if valve B is fully closed?

A. The pump will operate at shutoff head.

B. The pump will operate at runout conditions.

C. The pump available net positive suction head will increase.

D. The pump required net positive suction head will increase.

QUESTION: 13

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

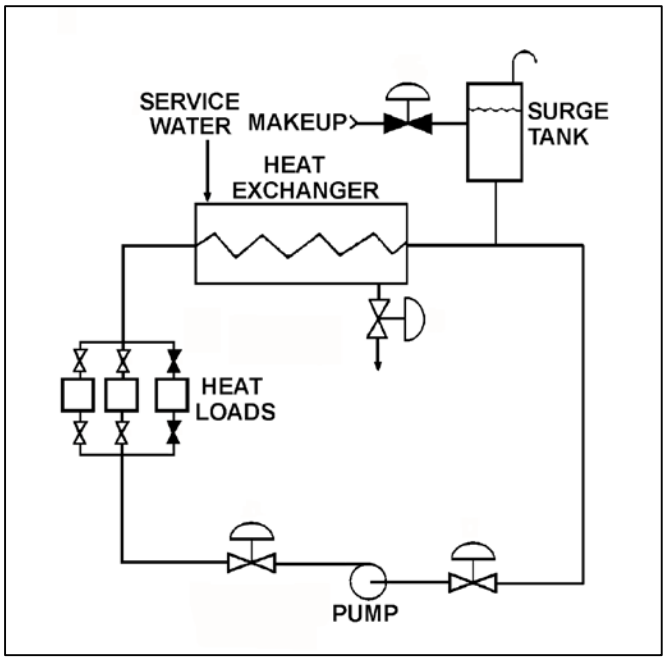
The pump is unable to achieve its rated volumetric flow rate due to cavitation. Which one of the following will enable the pump to achieve a higher volumetric flow rate before cavitation occurs?

A. Decrease the service water flow rate.

B. Operate the system at a lower pressure.

C. Move the surge tank connection closer to the suction of the pump.

D. Remove the existing pump motor and install a motor with a higher horsepower rating.



QUESTION: 14

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

22 KV
60 Hertz
975 MW
200 MVAR (out)

Main generator stator winding temperature is abnormally high. Which one of the following contains a combination of manual adjustments to the main generator speed control and voltage regulator setpoints such that each adjustment will reduce the main generator stator winding temperature? (Assume power factor remains less than 1.0.)

	Speed Setpoint	Voltage Setpoint
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease

QUESTION: 15

To minimize the adverse effects of starting current, an AC induction motor should be started _____ to _____ the stator counter electromotive force.

A. unloaded; quickly establish

B. unloaded; delay

C. partially loaded; quickly establish

D. partially loaded; delay

QUESTION: 16

A main turbine-generator was operating at 80 percent load with the following initial steady-state lube oil and cooling water 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

Six months later, the current steady-state heat exchanger temperatures are:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 120°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 120°F

Assume that the lube oil mass flow rate does not change, and that the specific heat values for the cooling water and lube oil do not change. Also assume that the main turbine lube oil system is a closed system.

The differences between the initial and current steady-state heat exchanger temperatures could be caused by the current main turbine-generator load being _____ with the current heat exchanger cooling water mass flow rate being _____.

A. higher; lower

B. higher; higher

C. lower; lower

D. lower; higher

QUESTION: 17

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

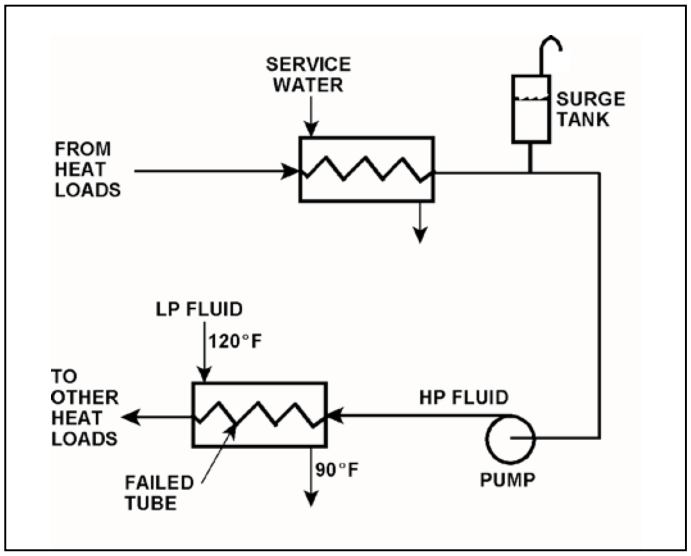
Which one of the following will occur as a result of the indicated tube failure in the heat exchanger?

A. High pressure (HP) fluid inventory increases.

B. Pressure in the low pressure (LP) system decreases.

C. Temperature in the low pressure (LP) system increases.

D. Level in the surge tank decreases.



QUESTION: 18

A mixed-bed ion exchanger is being used to process reactor coolant letdown. The ion exchanger is boron-saturated for the existing reactor coolant conditions.

Reactor coolant letdown temperature at the inlet to the ion exchanger increases by 15°F, while remaining within the normal temperature range. Because of the temperature increase, the total number of boron atoms occupying the ion exchange sites will _____; and the boron concentration in the ion exchanger effluent will _____.

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase

QUESTION: 19

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 would indicate that significant resin decomposition has occurred?

A. A significant decrease in the ion exchanger's effluent conductivity.

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

C. A significant increase in the ion exchanger's decontamination factor.

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

QUESTION: 20

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

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

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

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

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

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

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

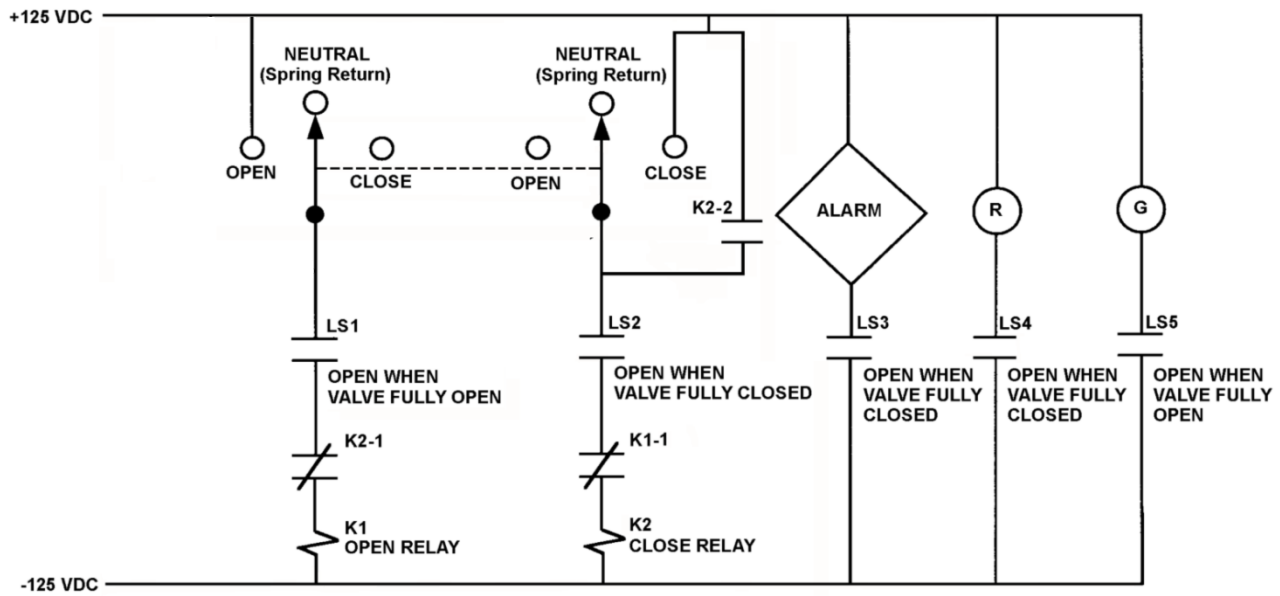
QUESTION: 21

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	Off
C.	Off	On	Off
D.	Off	Off	On



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 22

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

A. the generator supplying reactive power to the grid.

B. the generator attaining a leading power factor.

C. the generator acting as a real load to the grid.

D. motoring of the generator.

QUESTION: 23

Delayed neutrons are neutrons that...

A. have reached thermal equilibrium with the surrounding medium.

B. are expelled within 1.0×10^{-14} seconds of the fission event.

C. are produced from the radioactive decay of certain fission fragments.

D. are responsible for the majority of U-235 fissions.

QUESTION: 24

A reactor near the end of a fuel cycle has been shut down from 100 percent power and cooled down to 140°F over three days. During the cooldown, boron concentration was increased by 100 ppm. Given the following absolute values of reactivities added during the shutdown and cooldown, assign a (+) or (!) as appropriate and choose the current value of core reactivity.

Control rods = ( ) 6.918 %ΔK/K
Xenon = ( ) 2.675 %ΔK/K
Power defect = ( ) 1.575 %ΔK/K
Boron = ( ) 1.040 %ΔK/K
Cooldown = ( ) 0.500 %ΔK/K

A. -8.558 %ΔK/K

B. -6.358 %ΔK/K

C. -3.208 %ΔK/K

D. -1.128 %ΔK/K

QUESTION: 25

The total neutron flux in a shutdown reactor is constant at 5.0×10^3 n/cm^2-sec. If non-fission neutron sources are supplying a constant flux of 1.0×10^2 n/cm^2-sec, what is K_{eff}?

A. 0.98

B. 0.96

C. 0.94

D. Cannot be determined without additional information.

QUESTION: 26

During a reactor coolant system cooldown, positive reactivity is added to the core if the moderator temperature coefficient is negative. This is partially due to...

A. a decreasing thermal utilization factor.

B. an increasing thermal utilization factor.

C. a decreasing resonance escape probability.

D. an increasing resonance escape probability.

QUESTION: 27

Differential boron worth (ΔK/K/ppm) becomes more negative as...

A. burnable poisons deplete.

B. boron concentration increases.

C. moderator temperature increases.

D. fission product poison concentration increases.

QUESTION: 28

A control rod is positioned in a reactor with the following neutron flux parameters:

Core average thermal neutron flux = 1×10^{12} neutrons/cm^2-sec
Control rod tip thermal neutron flux = 5×10^{12} neutrons/cm^2-sec

If the control rod is slightly withdrawn such that the tip of the control rod is located in a thermal neutron flux of 1×10^{13} neutrons/cm^2-sec, the differential control rod worth will increase by a factor of _____. (Assume the core average thermal neutron flux is constant.)

A. 0.5

B. 1.4

C. 2.0

D. 4.0

QUESTION: 29

A reactor startup is in progress from a cold shutdown condition. During the reactor coolant heatup phase of the startup, differential control rod worth becomes _____ negative; and during the complete withdrawal of the initial bank of control rods, differential control rod worth becomes _____.

A. more; more negative initially and then less negative

B. more; less negative initially and then more negative

C. less; more negative during the entire withdrawal

D. less; less negative during the entire withdrawal

QUESTION: 30

A reactor was operating at 100 percent power for two weeks when power was quickly reduced to 50 percent. Core xenon-135 will reach a new equilibrium concentration in _____ hours.

A. 8 to 10

B. 20 to 25

C. 40 to 50

D. 70 to 80

QUESTION: 31

A nuclear power plant was initially operating at 100 percent power with equilibrium xenon-135. Then, power was decreased to 75 percent over a one-hour period. The operator is currently adjusting control rod position as necessary to maintain average reactor coolant temperature constant.

What will the control rod position and directional trend be 30 hours after power reached 75 percent?

A. Above the initial 75 percent power position and inserting slowly.

B. Above the initial 75 percent power position and withdrawing slowly.

C. Below the initial 75 percent power position and inserting slowly.

D. Below the initial 75 percent power position and withdrawing slowly.

QUESTION: 32

Why are burnable poisons installed in a new reactor core instead of simply using a higher reactor coolant boron concentration for reactivity control?

A. To prevent boron precipitation during normal operation.

B. To establish a more negative moderator temperature coefficient.

C. To minimize the distortion of the neutron flux distribution caused by soluble boron.

D. To allow the loading of excessive reactivity in the form of higher fuel enrichment.

QUESTION: 33

A reactor startup is in progress. The reactor is slightly subcritical with a constant startup rate of 0.0 dpm. A short control rod insertion will cause the reactor startup rate indication to initially become negative, and then...

A. gradually become less negative and return to 0.0 dpm.

B. gradually become more negative until neutron population reaches the source range equilibrium level, and then return to 0.0 dpm.

C. stabilize until neutron population reaches the source range equilibrium level, and then return to 0.0 dpm.

D. stabilize at -1/3 dpm until fission neutrons are no longer a significant contributor to the neutron population, and then return to 0.0 dpm.

QUESTION: 34

During a reactor startup, as K_{eff} increases toward 1.0 the value of 1/M...

A. decreases toward zero.

B. decreases toward 1.0.

C. increases toward infinity.

D. increases toward 1.0.

QUESTION: 35

Given:

- Reactors A and B are identical except that reactor A has an effective delayed neutron fraction of 0.0055 and reactor B has an effective delayed neutron fraction of 0.0052.
- Reactor A has a stable period of 42 seconds and reactor B has a stable period of 45 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: 36

A reactor startup is in progress near the end of a fuel cycle. Reactor power is 5×10^{-3} percent and increasing slowly with a stable 0.3 dpm startup rate. Assuming no operator action, no reactor trip, and no steam release, what will reactor power be after 10 minutes?

A. Below the point of adding heat (POAH).

B. At the POAH.

C. Above the POAH but less than 50 percent.

D. Greater than 50 percent.

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, the same constant water level, and a temperature of 60°F. They are surrounded by atmospheric pressure.

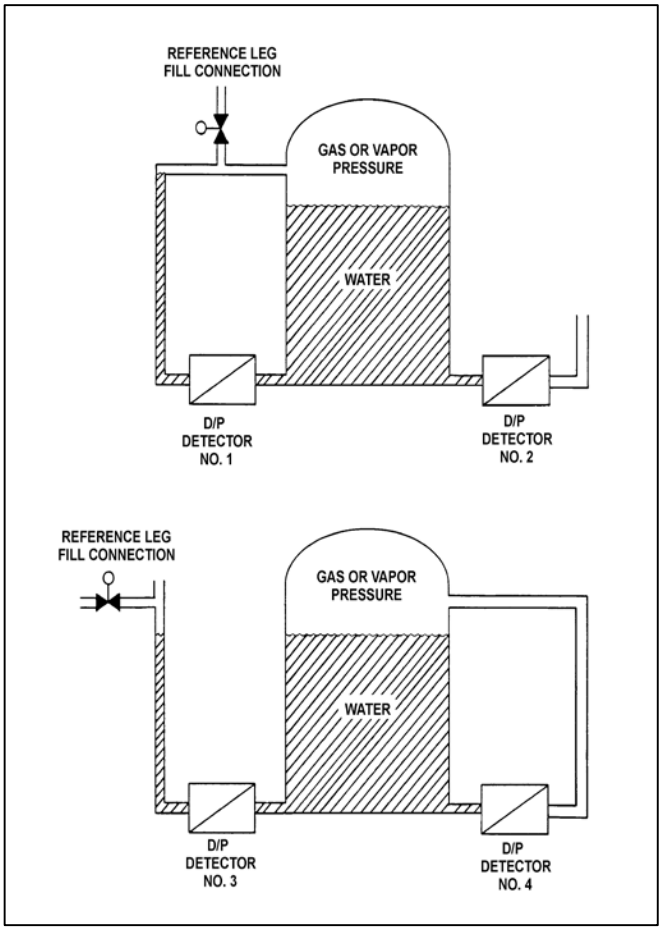
If a leak in the top of each tank causes a complete loss of overpressure, which detector(s) will produce a lower level indication?

A. No. 1 only

B. No. 2 only

C. No. 1 and 4

D. No. 2 and 3



QUESTION: 38

A steam-water mixture is initially saturated with a quality of 95 percent when a small amount of heat is added to the mixture. If the mixture remains saturated and pressure remains constant, the temperature of the mixture will _____; and the quality of the mixture will _____.

A. increase; remain the same

B. increase; increase

C. remain the same; remain the same

D. remain the same; increase

QUESTION: 39

A nuclear power plant experienced a loss of all AC electrical power due to a natural disaster. A few days later, there is turbulent boiling in the spent fuel pool. Average spent fuel temperature is elevated but stable. Assume that boiling is the only means of heat removal from the spent fuel pool.

Given the following stable current conditions:

Spent fuel decay heat rate = 4.8 MW
Spent fuel building pressure = 14.7 psia
Spent fuel pool temperature = 212°F

At what approximate rate is the mass of water in the spent fuel pool decreasing?

A. 4,170 lbm/hr

B. 4,950 lbm/hr

C. 14,230 lbm/hr

D. 16,870 lbm/hr

QUESTION: 40

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

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

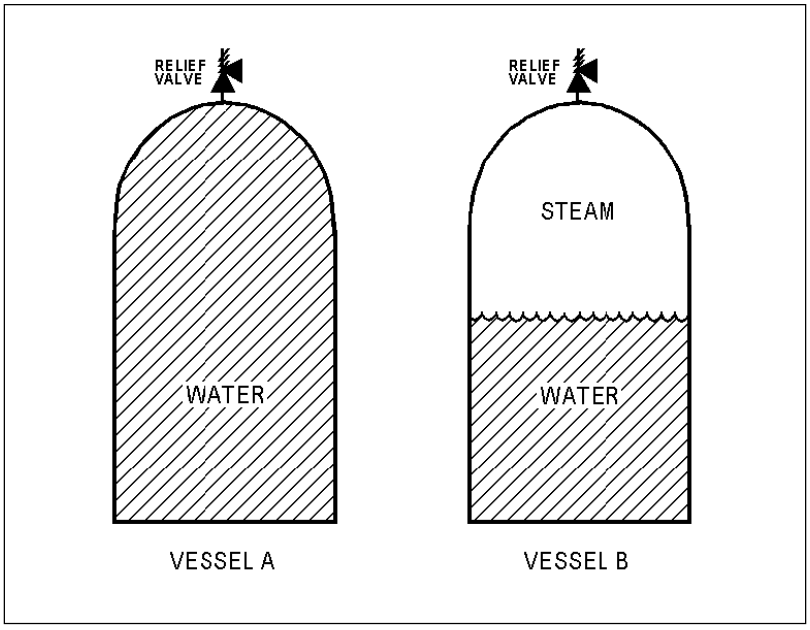
If both relief valves begin to leak at a rate of 0.1 percent of design flow, the higher temperature fluid will initially be leaving the relief valve of vessel _____. And, if 100 lbm of fluid is released through both relief valves, the larger pressure decrease will occur in vessel _____.

A. A; A

B. A; B

C. B; A

D. B; B



QUESTION: 41

Consider the steam cycle thermal efficiency of a nuclear power plant operating at rated power.

If the pressure at which saturated steam is produced in the steam generators is increased, thermal efficiency will _____; and if the temperature of the feedwater entering the steam generators is increased, thermal efficiency will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 42

A nuclear power plant is initially operating at steady-state 100 percent power. If an unplanned load rejection causes the main generator load to rapidly decrease to 90 percent, the voids in the two-phase flow in the steam generator tube bundle region will initially _____; which causes indicated steam generator water level (measured in the downcomer) to initially _____.

A. shrink; decrease

B. shrink; increase

C. expand; decrease

D. expand; increase

QUESTION: 43

The major concern with starting a main feedwater pump with downstream fluid in a saturated condition is...

A. cavitation.

B. water hammer.

C. thermal shock.

D. positive reactivity addition.

QUESTION: 44

When performing a heat balance calculation to determine core thermal power, the measured thermal power is _____ by a value associated with the reactor coolant pumps (RCPs); the adjustment is needed because _____ of the flow energy added to the reactor coolant by the RCPs is converted to thermal energy of the reactor coolant.

A. decreased; nearly all

B. decreased; a small fraction

C. increased; nearly all

D. increased; a small fraction

QUESTION: 45

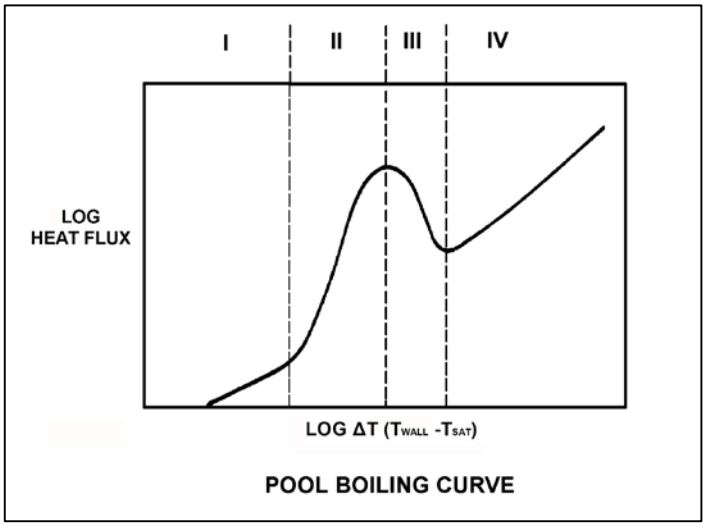
Refer to the drawing of a pool boiling curve (see figure below). In which region of the curve does the most efficient form of heat transfer occur?

A. Region I

B. Region II

C. Region III

D. Region IV



QUESTION: 46

The departure from nucleate boiling (DNB) ratio is defined as the...

A. actual heat flux divided by the critical heat flux.

B. critical heat flux divided by the actual heat flux.

C. actual core thermal power divided by the rated core thermal power.

D. rated core thermal power divided by the actual core thermal power.

QUESTION: 47

Which one of the following is most likely to result in steam bubble formation in a reactor vessel head while maintaining a 40°F subcooling margin in the hottest RCS hot leg?

A. Performing a 25°F/hr RCS cooldown with natural circulation.

B. Performing a 25°F/hr RCS cooldown with forced circulation.

C. Performing a 50°F/hr RCS cooldown with natural circulation.

D. Performing a 50°F/hr RCS cooldown with forced circulation.

QUESTION: 48

A reactor coolant system natural circulation cooldown is in progress with steam release from the steam generator (SG) atmospheric steam relief valves (operated in manual control).

If voids interrupt natural circulation, which one of the following will occur? (Assume feedwater flow rate, SG relief valve position, and decay heat level are constant.)

A. SG pressure will decrease and core exit thermocouple (CET) temperatures will increase.

B. SG pressure will decrease and CET temperatures will remain constant.

C. SG pressure will increase and CET temperatures will increase.

D. SG pressure will increase and CET temperatures will remain constant.

QUESTION: 49

A reactor is operating at 3,300 MW thermal power. The core linear power density limit is 12.4 kW/ft.

Given:

- The reactor core contains 198 fuel assemblies.
- Each fuel assembly contains 262 fuel rods, each with an active length of 12 feet.
- The highest total peaking factors measured in the core are as follows:

  Location A: 2.5
  Location B: 2.4
  Location C: 2.3
  Location D: 2.2

Which one of the following describes the operating conditions in the core relative to the linear power density limit?

A. All locations in the core are operating below the linear power density limit.

B. Location A has exceeded the linear power density limit while locations B, C, and D are operating below the limit.

C. Locations A and B have exceeded the linear power density limit while locations C and D are operating below the limit.

D. Locations A, B, and C have exceeded the linear power density limit while location D is operating below the limit.

QUESTION: 50

Which one of the following operating limitations is designed to prevent brittle fracture of the reactor vessel and/or the reactor coolant system (RCS)?

A. Maximum setpoint for the pressurizer safety valves.

B. Maximum differential pressure between the RCS and the steam generators.

C. Maximum RCS pressure versus RCS temperature for a given RCS heatup rate.

D. Maximum differential temperature between the RCS and the pressurizer.

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

JUNE 2015 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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