UNITED STATES NUCLEAR REGULATORY COMMISSION
GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2020 PWR – FORM A

DO <u>NOT</u> BEGIN THIS EXAMINATION UNTIL DIRECTED TO DO SO.

<u>Please Print:</u>

Name:

Docket No.:   <u>55-</u>

Facility:

Start Time: Stop Time:

<u>Instructions to Examinee:</u>

This examination applies to a typical U.S. pressurized water reactor (PWR) nuclear power plant. There are 50 multiple-choice test items to answer, each having equal point value. There are multiple forms of this examination, each containing the same test items in a random order. Answer all test items using the provided answer sheet, ensuring a single answer is marked for each test item. A score of at least 80 percent is required to pass this portion of the NRC operator licensing written examination. When you have completed the examination, sign your name under the statement at the bottom of this page. All examination materials will be collected 3 hours after the examination begins.

KNOWLEDGE AREA	NUMBER OF TEST ITEMS	PERCENT OF TOTAL	SCORE
COMPONENTS	22	44	
REACTOR THEORY	14	28	
THERMODYNAMICS	14	28	
TOTALS	<u>50</u>	<u>100</u>	

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

Examinee 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. Scrap paper will be provided for calculations.

7. 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.

8. Do not make assumptions regarding conditions that are not specified in the question unless they occur as a consequence of other conditions that are stated in the question. For example, you should not assume operator actions have been taken. Also, this examination tests knowledge of general fundamentals, therefore do not make assumptions based on specific plant procedures.

9. Cheating on the examination will result in the automatic forfeiture of this examination. Cheating could also result in severe penalties.

10. 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.

11. 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.

12. 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.

13. 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

- -

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

$\lambda_{eff} = 0.1\ sec^{-1}\ (for\ \rho > 0)$

$DRW \propto \varphi_{tip}^2\ /\ \varphi_{avg}^2$

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

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

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

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

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

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = I^2 R$

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

$P_R = \sqrt{3}IEsin\theta$

Thermal Efficiency = Net Work Out/Energy In

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

$g = 32.2\ ft/sec^2$

$g_c = 32.2\ lbm\text{-}ft/lbf\text{-}sec^2$

CONVERSIONS

- -

$1\ MW = 3.41\ \text{x}\ 10^6\ Btu/hr$	$°C = (5/9)(°F - 32)$	$1\ ft_{water}^3 = 7.48\ gal$
$1\ hp = 2.54\ \text{x}\ 10^3\ Btu/hr$	$°F = (9/5)(°C) + 32$	$1\ gal_{water} = 8.35\ lbm$
$1\ Btu = 778\ ft\text{-}lbf$	$1\ kg = 2.21\ lbm$	$1\ Curie = 3.7\ \text{x}\ 10^{10}\ dps$

QUESTION: 1

Refer to the partial drawing of two identical single-speed radial-flow centrifugal pumps in a cooling water system (see figure below).   Pumps 1 and 2 are driven by identical three-phase AC induction motors.   Initially, pump 1 is operating normally and pump 2 is stopped.

Then pump 2 is started, but its discharge check valve remains partially closed.   When conditions stabilize, pump _____ will have the <u>smaller</u> motor current; and pump _____ will have the <u>greater</u> discharge head.

A. 1; 1

B. 1; 2

C. 2; 1

D. 2; 2
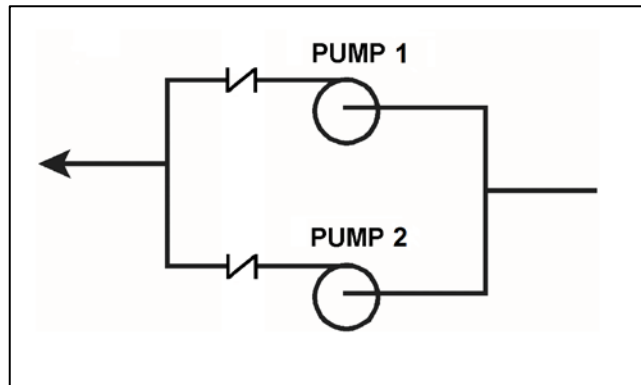
QUESTION: 2

Given:

- A direct-acting proportional pneumatic controller will be used to maintain level in a water storage tank by positioning an air-operated flow control valve in the tank's makeup water supply line.
- The controller's input will vary directly with tank 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
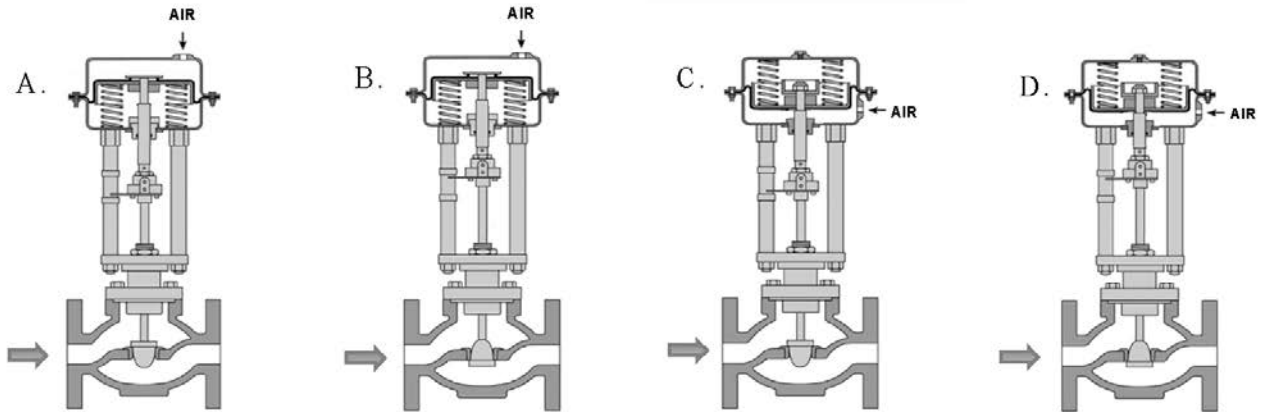
D. D and A

QUESTION: 3

Given the following information for a reactor:

Reactivity (ρ)   = 0.0060
Average delayed neutron fraction ($\overline{\beta}$)   = 0.0058
Effective delayed neutron fraction ($\overline{\beta}_{eff}$)   = 0.0062

The reactor is _____, and the reactor fission rate is _____.

A. prompt critical; constant

B. prompt critical; increasing

C. not prompt critical; constant

D. not prompt critical; increasing

QUESTION: 4

One week after a refueling outage, a nuclear power plant is currently operating at 80 percent power with control rods fully withdrawn. During the outage, the entire core was replaced by new fuel assemblies, and new burnable poison assemblies were installed at various locations.

Assume reactor power and control rod position do not change during the next week.   If no operator action is taken, how and why will average reactor coolant temperature change during the next week?

A. Decrease slowly, due to fuel burnup only.

B. Decrease slowly, due to fuel burnup and fission product poison buildup.

C. Increase slowly, due to burnable poison burnout only.

D. Increase slowly, due to burnable poison burnout and fission product poison decay.

QUESTION: 5

Refer to the graph of neutron flux versus time (see figure below) for a nuclear power plant that experienced a reactor trip from steady-state 100 percent power at time = 0.

The shape of section B of the curve is determined primarily by the decreasing production rate of…

A. prompt fission neutrons.

B. delayed fission neutrons.

C. intrinsic source neutrons.

D. installed source neutrons.
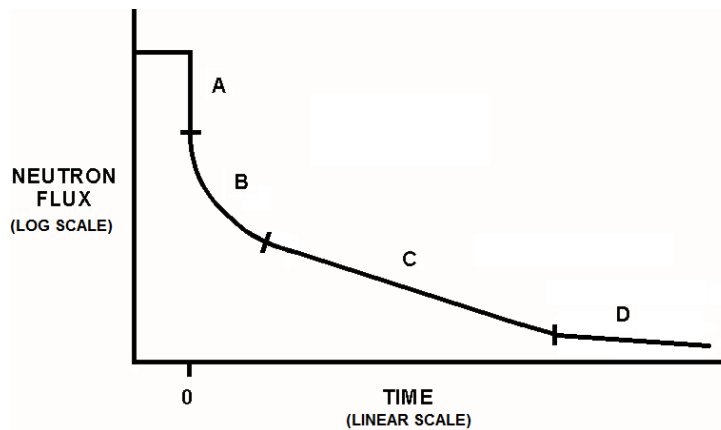
QUESTION: 6

An ideal (no slip) reciprocating positive displacement pump is operating to provide makeup water to a reactor coolant system that is being maintained at 1,000 psig.   The discharge valve of the pump was found to be throttled to 80 percent open.

If the valve is subsequently fully opened, pump flow rate will _____; and pump head will _____.

A. increase; decrease

B. remain constant; decrease

C. increase; remain constant

D. remain constant; remain constant

QUESTION: 7

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 17 psia gas pressure. The tanks are located in a building that is currently at atmospheric pressure. All level detectors are producing level indications of 70 percent.

If a malfunction in the building ventilation system decreases the pressure surrounding the tanks, which level detectors will produce the lowest level indications?

A. 1 and 3

B. 1 and 4

C. 2 and 3

D. 2 and 4
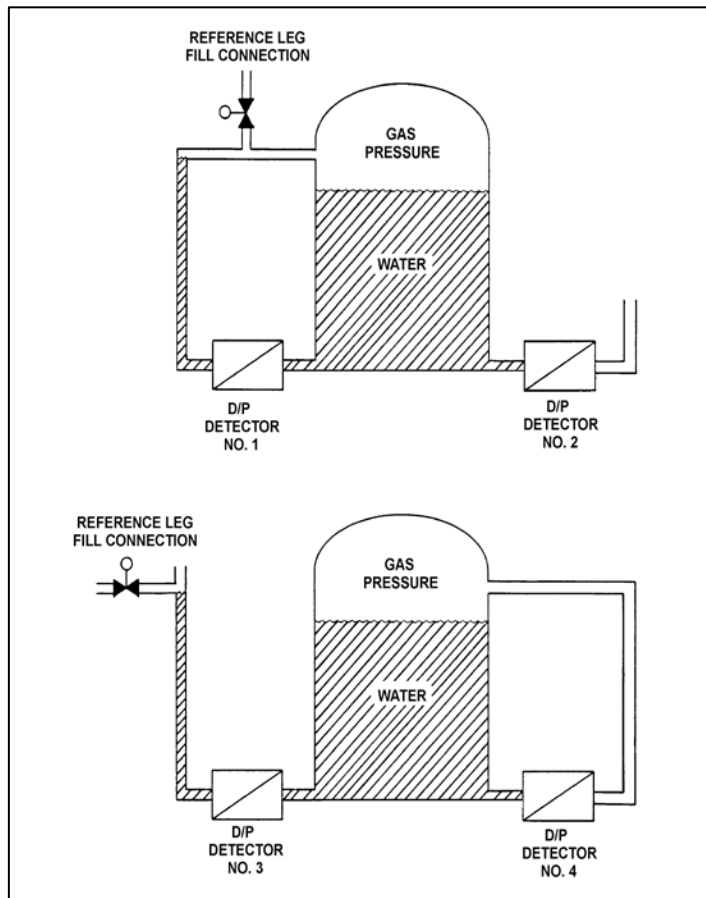
QUESTION: 8

Condensate depression is the process of...

A. removing condensate from the turbine exhaust steam.

B. spraying condensate into the turbine exhaust steam.

C. heating turbine exhaust steam above its saturation temperature.

D. cooling turbine exhaust steam below its saturation temperature.

QUESTION: 9

A main generator is about to be connected to an infinite power grid with the following conditions:

    Generator frequency = 59.8 Hz
    Grid frequency   = 59.5 Hz
    Generator voltage   = 114.8 KV
    Grid voltage   = 115.1 KV

When the generator output breaker is closed, the generator will initially...

A. acquire real load and reactive load.

B. acquire real load, but become a reactive load to the grid.

C. become a real load to the grid, but acquire reactive load.

D. become a real load and a reactive load to the grid.

QUESTION: 10

A gas-filled radiation detector operating in the ion chamber region is exposed to a constant gamma radiation field. If the detector's applied voltage is increased, but kept within the ion chamber region, the detector's output will…

A. increase, because the production rate of secondary ions will increase.

B. increase, because the recombination rate of primary ions will decrease.

C. remain the same, because the detector is already producing its maximum output.

D. remain the same, because the detector's operation is unaffected by the change in applied voltage.

QUESTION: 11

A liquid is saturated with 0 percent quality.   Assuming pressure remains constant, the addition of a small amount of heat will...

A. raise the steady-state liquid temperature above the boiling point.

B. result in a subcooled liquid.

C. result in some of the liquid vaporizing.

D. result in a superheated liquid.

QUESTION: 12

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

The temperature control system uses a reverse-acting proportional controller and a direct-acting transmitter.   The controller's proportional band is 80°F to 130°F.

Which one of the following will be the controller's output percentage when the measured lube oil temperature is 98°F?

A. 18 percent

B. 32 percent

C. 36 percent

D. 64 percent
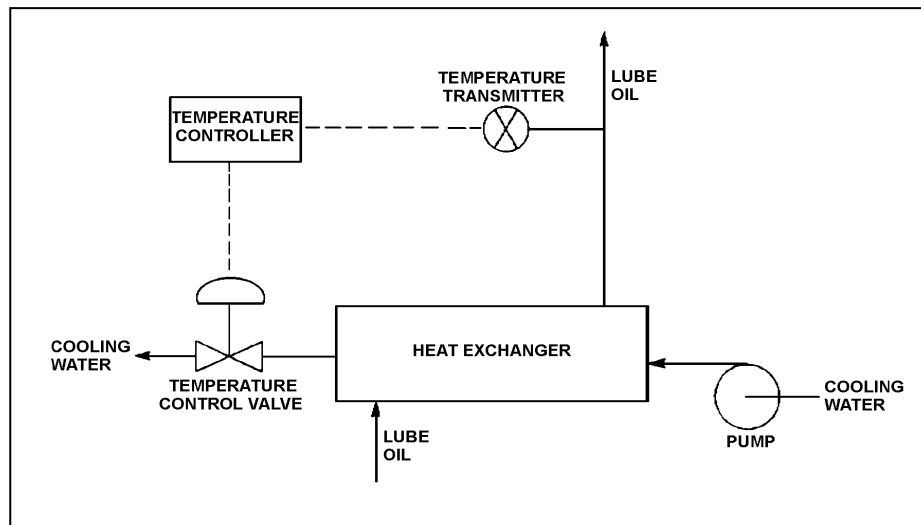
QUESTION: 13

Two identical reactors are currently shut down for refueling.   Reactor A has been operating for 35 years with an average lifetime capacity factor of 90 percent.   Reactor B has been operating for 45 years with an average lifetime capacity factor of 75 percent.

Compared to reactor B, reactor A has been exposed to _____ fast neutron irradiation, and has a _____ reactor vessel nil-ductility transition temperature.

A. less; lower

B. less; higher

C. more; lower

D. more; higher
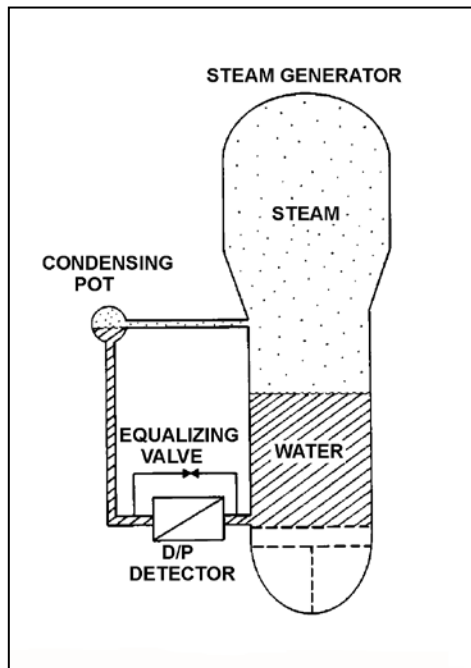
QUESTION: 14

Refer to the drawing of a steam generator (SG) differential pressure (D/P) level detection system (see figure below).

The SG is supplying steam at normal operating temperature and pressure and the level instrumentation has just been calibrated.   Which one of the following events will result in a SG level indication that is <u>less</u> than the actual SG level?

A. SG pressure increases by 50 psi.

B. Actual SG water level decreases by 6 inches.

C. The external pressure surrounding the D/P detector decreases by 2 psi.

D. The temperature surrounding the reference leg increases by 20°F.

QUESTION: 15

Which one of the following types of neutrons has an average neutron generation lifetime of 12.5 seconds?

A. Prompt

B. Delayed

C. Fast

D. Thermal

QUESTION: 16

Which one of the following must exist for natural circulation flow to occur?

A. The heat source must be larger than the heat sink.

B. The heat source must be located higher than the heat sink.

C. The heat sink must be larger than the heat source.

D. The heat sink must be located higher than the heat source.

QUESTION: 17

A reactor was shut down for 7 days to perform maintenance. Then, a reactor startup was performed, and reactor power was increased from 1 percent to 50 percent over a 2 hour period.

Ten hours after reactor power reaches 50 percent, the xenon-135 concentration will be…

A. increasing toward a downturn.

B. increasing toward an equilibrium value.

C. decreasing toward an equilibrium value.

D. decreasing toward an upturn.

QUESTION: 18

The starting current for a typical AC induction motor is usually much higher than the full-load running current because...

A. starting torque is lower than full-load running torque.

B. starting torque is higher than full-load running torque.

C. rotor speed during start is too low to generate significant counter electromotive force in the stator.

D. rotor current during start is too low to generate significant counter electromotive force in the stator.
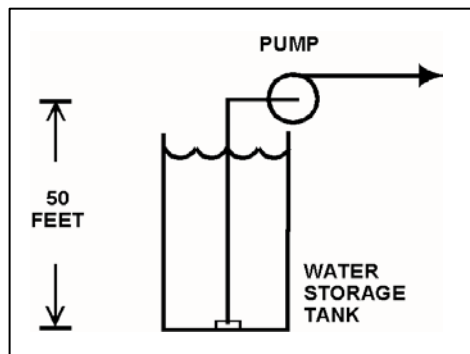
QUESTION: 19

Refer to the drawing of a centrifugal pump taking suction from the bottom of an open water storage tank (see figure below).

Given:

- The tank contains 60°F water.
- The eye of the pump impeller is located 50 feet above the bottom of the tank.
- The pump requires a minimum net positive suction head of 4 feet.

Which one of the following describes the effect on pump operation if tank water level is allowed to continuously decrease?

A. The pump will operate normally until tank water level decreases below approximately 20 feet, at which time the pump will cavitate.

B. The pump will operate normally until tank water level decreases below approximately 16 feet, at which time the pump will cavitate.

C. The pump will operate normally until the pump suction becomes uncovered, at which time the pump will cavitate.

D. The pump will operate normally until the pump suction becomes uncovered, at which time the pump will become air bound.

QUESTION: 20

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

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 21

A reactor is shut down at normal operating temperature and pressure with all control rods inserted. Which one of the following will decrease the departure from nucleate boiling ratio for this reactor? (Assume the reactor remains shutdown.)

A. Fully withdrawing a bank of shutdown rods.

B. Diluting reactor coolant boron concentration by 50 ppm.

C. Reducing reactor coolant temperature by 5°F.

D. Decreasing reactor coolant pressure by 10 psig.

QUESTION: 22

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

If mineral deposits accumulate on the inside of the cooling water tubes, cooling water outlet temperature will _____; and lube oil outlet temperature will _____. (Assume the lube oil and cooling water inlet temperatures and flow rates do <u>not</u> change.)

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase
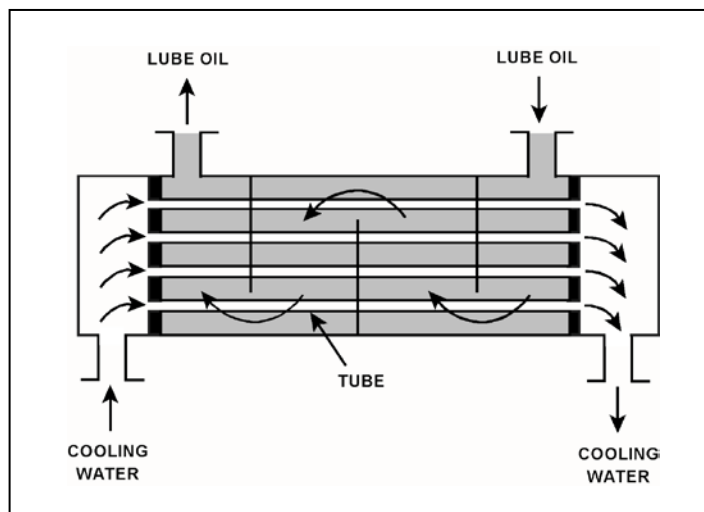
QUESTION: 23

A reactor is shutdown with the reactor vessel head removed for refueling.   The core is covered by 23 feet of refueling water at 100°F with a boron concentration of 2,000 ppm.

Which one of the following will decrease core K_{eff}?

A. An unrodded spent fuel assembly is removed from the core.

B. Refueling water temperature is increased to 105°F.

C. A depleted neutron source is removed from the core.

D. Refueling water boron concentration is decreased by 5 ppm.

QUESTION: 24

Initially, a nuclear power plant was operating at steady-state 85 percent reactor power when the extraction steam to a high-pressure feedwater heater became isolated. Main generator load was 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. greater; lower

B. greater; higher

C. less; lower

D. less; higher

QUESTION: 25

Refer to the drawing of an operating cooling water system (see figure below) in which valve A is one-half open.   Currently, the centrifugal pump is providing a system flow rate of 600 gpm.

If valve A is opened further, until system flow rate is 800 gpm, the differential pressure across valve A will _____; and the differential pressure across the heat exchanger will _____.

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase
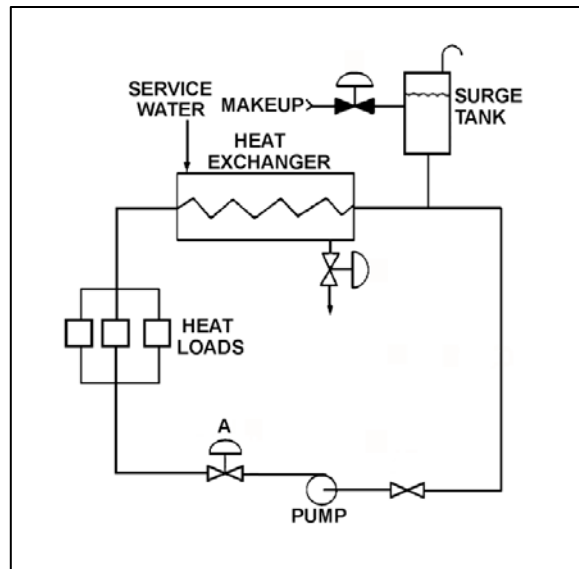
QUESTION: 26

If a 60°F subcooling margin is maintained in the hottest reactor coolant system (RCS) hot leg, which one of the following evolutions will produce the <u>smallest</u> subcooling margin in the reactor vessel head?

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

B. Performing a 50°F/hr RCS cooldown using natural circulation.

C. Performing a 25°F/hr RCS heatup using forced circulation.

D. Performing a 50°F/hr RCS heatup using forced circulation.

QUESTION: 27

Refer to the drawing of an operating water cleanup system (see figure below) in which valves A, B, C, and D are fully open. Currently, the centrifugal pump is providing a cleanup water flow rate of 120 gpm.

If valve C is throttled to 50 percent, how will the temperatures at points 3 and 6 be affected?

	Point 3	Point 6
A.	Decrease	Decrease
B.	Decrease	Increase
C.	Increase	Decrease
D.	Increase	Increase
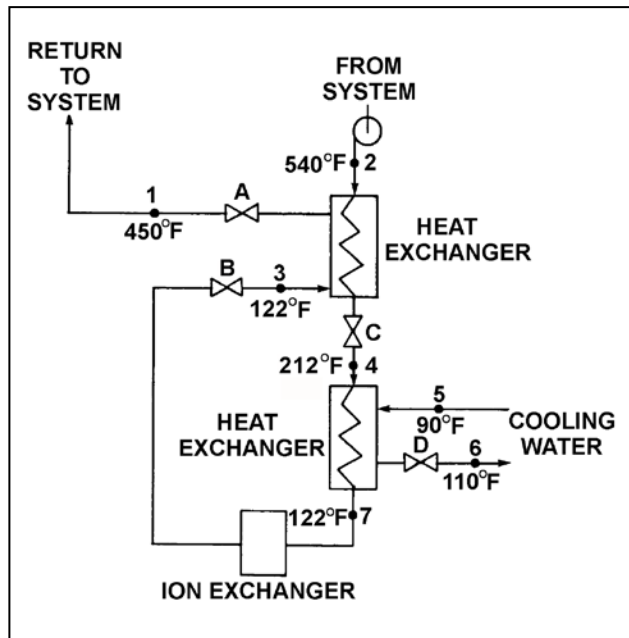
QUESTION: 28

A Geiger-Mueller detector with a "pancake" probe is being used to monitor workers leaving a radiologically controlled area for contamination.   The probe is sensitive to alpha, beta, and gamma radiation.   The background count rate is 20 cpm.   As one worker's shoe is scanned the count rate increases to 1,000 cpm.

Given the following separate actions:

- When a sheet of paper is placed between the probe and the shoe, the count rate decreases to 600 cpm.
- When a sheet of aluminum foil is placed between the probe and the shoe, the count rate decreases to 600 cpm.

Which one of the following lists the type(s) of radiation being emitted by the contamination?

A. Beta only

B. Alpha only

C. Beta and gamma

D. Alpha and gamma

QUESTION: 29

Refer to the drawing of a valve motor control circuit (see figure below).

The valve is currently closed with the contact configuration as shown. If the S1 pushbutton is depressed, the valve will _____; and when the S1 pushbutton is subsequently released, the valve will _____.

A. open; close

B. open; remain open

C. remain closed; open

D. remain closed; remain closed
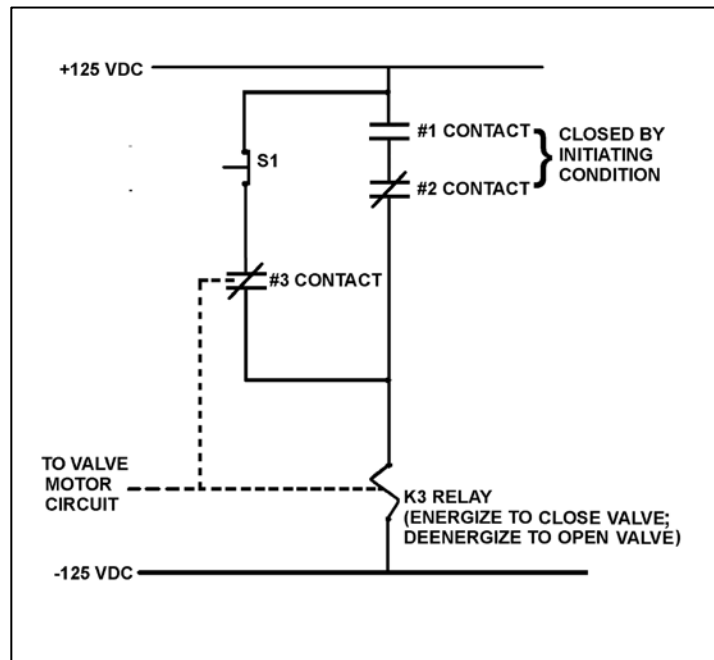
QUESTION: 30

The following indications are observed in the control room for a normally-open motor control center (MCC) breaker that directly starts/stops a 480 VAC motor:

Red position indicating light is lit.
Green position indicating light is out.
Motor load current indicates 0 amps.
MCC voltage indicates 480 volts.

What is the condition of the breaker?

A. Open and racked in

B. Closed and racked in

C. Open and racked to the TEST position

D. Closed and racked to the TEST position

QUESTION: 31

Consider a stationary steam nozzle in the first stage of a main turbine.   Assume the steam nozzle is frictionless, with no heat gain or loss.

Compared to the enthalpy of the steam entering the nozzle, the enthalpy of the steam exiting the nozzle is _____, because the nozzle converts _____.

A. lower; enthalpy into kinetic energy.

B. lower; enthalpy into flow energy.

C. the same; flow energy into kinetic energy.

D. the same; kinetic energy into flow energy.

QUESTION: 32

A reactor has operated at steady-state 100 percent power for the past 6 months. Compared to 6 months ago, the current moderator temperature coefficient is...

A. more negative, due to control rod withdrawal.

B. less negative, due to control rod insertion.

C. more negative, due to a smaller reactor coolant boron concentration.

D. less negative, due to a greater reactor coolant boron concentration.

QUESTION: 33

A reactor is critical at 1.0×10^{-6} percent power. Control rods are <u>withdrawn</u> for 5 seconds and then stopped, resulting in a stable startup rate (SUR) of positive 0.2 DPM.

If the control rods had been <u>inserted</u> for 5 seconds instead of withdrawn, the stable SUR would have been: (Assume equal absolute values of reactivity are added in both cases.)

A. more negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases result in smaller delayed neutron fractions.

B. more negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases are less limited by delayed neutrons.

C. less negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases result in larger delayed neutron fractions.

D. less negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases are more limited by delayed neutrons.

QUESTION: 34

A reactor is operating at 80 percent power near the middle of a fuel cycle.   The control rods are nearly fully withdrawn and in manual control.   Core axial power distribution is peaked below the core midplane.

Which one of the following will increase the core maximum axial peaking (or hot channel) factor? (Assume no operator action is taken unless stated, and that main turbine load and core xenon-135 distribution do not change unless stated.)

A. Turbine load/reactor power is reduced by 10 percent.

B. The controlling bank of control rods is withdrawn 4 inches.

C. Reactor coolant system boron concentration is reduced by 15 ppm.

D. A fully withdrawn control rod located at the edge of the core drops to the bottom of the core.

QUESTION: 35

An ideal auxiliary steam turbine exhausts to the atmosphere.   The steam turbine is supplied with dry saturated steam at 900 psia.   Which one of the following is the maximum specific work (Btu/lbm) that can be extracted from the steam by the steam turbine?

A. 283 Btu/lbm

B. 670 Btu/lbm

C. 913 Btu/lbm

D. 1,196 Btu/lbm

QUESTION: 36

A nuclear power plant was operating at full power when a 200 gpm reactor coolant leak caused a reactor trip and initiation of emergency coolant injection. Reactor coolant system pressure stabilized at 1,000 psia.

Currently, all centrifugal injection pumps are operating with all pump recirculation flowpaths isolated. The shutoff heads for the pumps are as follows:

   High pressure coolant injection (HPCI) pumps = 2,500 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: 37

Initially, a reactor is shut down with <u>no</u> xenon-135 in the core. Over the next 4 hours, the reactor is made critical and power level is increased to10 percent. The shift supervisor has directed that power level and reactor coolant temperature be maintained constant for 12 hours.

To accomplish this objective, control rods will have to be...

A. inserted periodically for the duration of the 12 hours.

B. withdrawn periodically for the duration of the 12 hours.

C. inserted periodically for 4 to 6 hours, and then withdrawn periodically.

D. withdrawn periodically for 4 to 6 hours, and then inserted periodically.

QUESTION: 38

Why are burnable poisons installed in a new reactor core <u>instead</u> of 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: 39

Initially, a nuclear power plant was shut down with a K_{eff} of 0.92, and a stable source range count rate of 200 cps. Then a reactor startup was initiated. All control rod motion was stopped when K_{eff} reached 0.995. The instant that control rod motion stopped, the source range count rate was 1,800 cps.

When the source range count rate stabilizes, the count rate will be approximately...

A. 1,800 cps

B. 3,200 cps

C. 3,400 cps

D. 5,000 cps

QUESTION: 40

A main steam system uses a combination of safety valves 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: 41

Cavitation is the formation of vapor bubbles in the _____ of a pump; with the subsequent collapse of the vapor bubbles in the _____ of the pump.

A. impeller; casing

B. impeller; discharge piping

C. volute; casing

D. volute; discharge piping

QUESTION: 42

What is the purpose of the reference junction panel that is provided with many thermocouple circuits?

A. Ensures that thermocouple output is amplified sufficiently for use by temperature indication devices.

B. Ensures that temperature changes away from the thermocouple measuring junction do <u>not</u> affect thermocouple temperature indication.

C. Ensures that electrical noise in the thermocouple extension wires does <u>not</u> affect thermocouple temperature indication.

D. Ensures that different lengths of thermocouple extension wires do <u>not</u> affect thermocouple temperature indication.

QUESTION: 43

The ion exchange efficiency of a condensate demineralizer is determined by performing a calculation using the...

A. demineralizer inlet and outlet pH.

B. demineralizer inlet and outlet conductivity.

C. change in pH at the outlet of the demineralizer over a period of time.

D. change in conductivity at the outlet of the demineralizer over a period of time.

QUESTION: 44

Refer to the drawing showing two different operating points for the same centrifugal pump operating in the same cooling water system (see figure below).

Operating point A was generated from pump data collected two days ago.   Operating point B was generated from pump data collected today.   Which one of the following would cause the observed difference between operating points A and B?

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

B. The pump was rotating slower when data was collected for operating point B.

C. The pump discharge valve was more open when data was collected for operating point B.

D. The pump discharge valve was more closed when data was collected for operating point B.
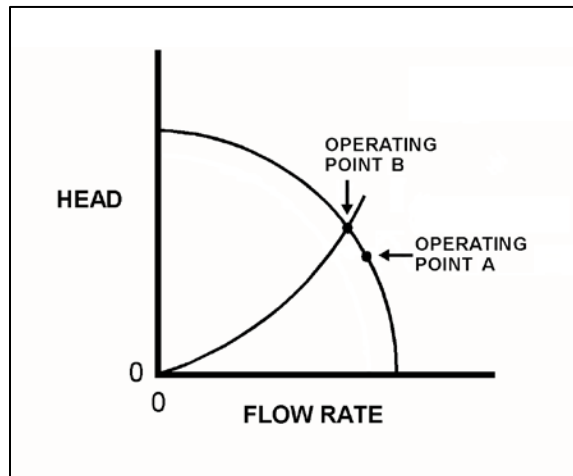
QUESTION: 45

Which one of the following parameters typically has the greatest influence on the shape of a differential rod worth curve?

A. Core radial neutron flux distribution

B. Core axial neutron flux distribution

C. Core xenon-135 distribution

D. Burnable poison distribution

QUESTION: 46

The power range nuclear instruments have been adjusted to 100 percent based on a heat balance calculation. Which one of the following will result in indicated reactor power being lower than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 20°F higher than actual feedwater temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

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

D. The steam pressure used in the heat balance calculation was 50 psi lower than actual steam pressure.

QUESTION: 47

Reactor coolant letdown is aligned with observable flow through a mixed-bed ion exchanger. If the temperature of the reactor coolant letdown decreases from 110°F to 90°F, the boron concentration in the ion exchanger effluent will _____; primarily due to the change in boron-removal effectiveness of the _____ exchange resin.

A. increase; anion

B. increase; cation

C. decrease; anion

D. decrease; cation

QUESTION: 48

Which one of the following is a characteristic that applies to a proportional-only controller, but not to a proportional-integral controller?

A. Gain

B. Offset

C. Rate component

D. Bistable component

QUESTION: 49

Which one of the following will result in a higher probability and/or severity of water hammer in a flowing water system?

A. Gradual pipe bends rather than sharp pipe bends.

B. Shorter pipe lengths rather than longer pipe lengths.

C. Lower initial flow rates rather than higher initial flow rates.

D. Shorter valve stroke times rather than longer valve stroke times.

QUESTION: 50

Why are control rod insertion limits established for power operation?

A. To minimize the worth of a dropped control rod.

B. To maintain a negative moderator temperature coefficient.

C. To provide adequate shutdown margin after a reactor trip.

D. To ensure sufficient positive reactivity is available to compensate for the existing power defect.

*** FINAL ANSWER KEY ***

NRC GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2020 PWR

	FORM A				FORM B		
NO.	ANS.	NO.	ANS.	NO.	ANS.	NO.	ANS.
1	D	26	B	1	C	26	D
2	D	27	A	2	B	27	D
3	D	28	D	3	A	28	A
4	B	29	B	4	B	29	B
5	B	30	D	5	D	30	A
6	B	31	A	6	B	31	A
7	B	32	C	7	A	32	D
8	D	33	D	8	D	33	D
9	B	34	C	9	B	34	B
10	D	35	A	10	B	35	B
11	C	36	A	11	B	36	C
12	D	37	B	12	D	37	A
13	A	38	B	13	B	38	D
14	A	39	B	14	C	39	D
15	B	40	D	15	A	40	D
16	D	41	A	16	A	41	B
17	B	42	B	17	C	42	D
18	C	43	B	18	D	43	D
19	A	44	D	19	A	44	A
20	C	45	B	20	C	45	B
21	D	46	A	21	B	46	A
22	D	47	C	22	C	47	B
23	A	48	B	23	C	48	D
24	A	49	D	24	B	49	B
25	B	50	C	25	B	50	D