UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2019 BWR – FORM A

DO **NOT** BEGIN THIS EXAMINATION UNTIL DIRECTED TO DO SO.

Please Print:

Name:

Docket No.: 55-

Facility:

Start Time: Stop Time:

Instructions to Examinee:

This examination applies to a typical U.S. boiling water reactor (BWR) 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	50	100	

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

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

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

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

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

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

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

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

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = I^2 R$

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

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

Thermal Efficiency $=$ Net Work Out/Energy In

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

$g = 32.2\ ft/sec^2$

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

CONVERSIONS

- -

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

QUESTION: 1

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

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

A. Pressure is 499.96 psia.

B. Enthalpy is 977.33 Btu/lbm.

C. Entropy is 1.17 Btu/lbm -°R.

D. Specific volume is 0.817 ft³/lbm.

QUESTION: 2

A motor-driven radial-flow centrifugal pump is used to provide makeup water to a vented storage tank that is 30 feet high. The pump is located at the base of the tank. The pump can be aligned to fill the tank via a top connection or a bottom connection using piping of equal lengths and diameters. The tank is currently empty.

With tank filling underway, the pump motor will have the lowest power demand if the pump is using the _____ connection; and the tank will require the least amount of time to become completely full if the pump is using the _____ connection.

A. top; top

B. top; bottom

C. bottom; top

D. bottom; bottom

QUESTION: 3

Initially, a reactor was operating at steady-state 100 percent power when a loss of offsite power caused a reactor scram and a loss of forced reactor coolant flow. Several minutes later, the occurrence of natural circulation flow will be indicated by a differential _____ across the core plate and coolant flow through the _____ pumps.

A. temperature; recirculation

B. temperature; jet

C. pressure; recirculation

D. pressure; jet

QUESTION: 4

Refer to the drawing of a cooling water system using 10-inch diameter pipe (see figure below). Only centrifugal pump A is operating and the flow control valve (FCV) is 80 percent open.

Which one of the following actions will increase the total head loss in the system?

A. Increase the system flow rate by starting centrifugal pump B.

B. Increase the system flow rate by opening the flow control valve more.

C. Replace a 20 foot section of 10-inch diameter pipe with a 10 foot section of 10-inch diameter pipe.

D. Replace a 20 foot section of 10-inch diameter pipe with a 20 foot section of 12-inch diameter pipe.
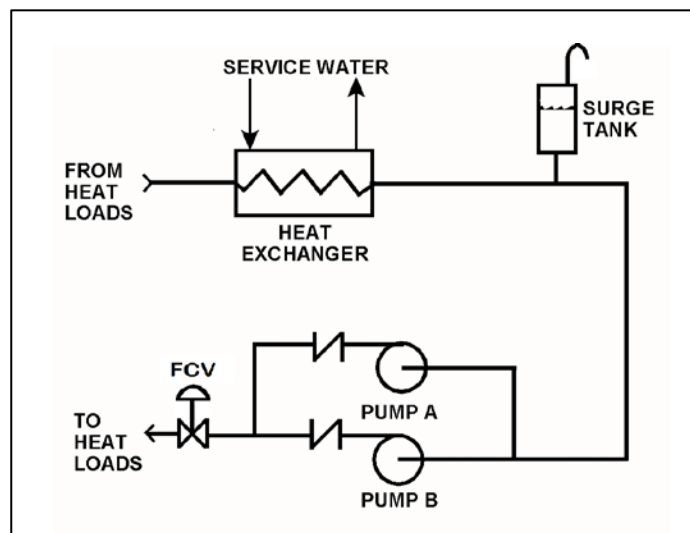
QUESTION: 5

A section of pipe is being hydrostatically tested to 1,400 psig using a positive displacement pump. The operating characteristics of the positive displacement pump are shown in the drawing below.

Which one of the following could cause the difference between the expected and the actual pump performance?

A. Pump internal leakage is greater than expected.

B. Pipe section boundary valve leakage is greater than expected.

C. A relief valve on the pump discharge piping opened prior to its setpoint of 1,400 psig.

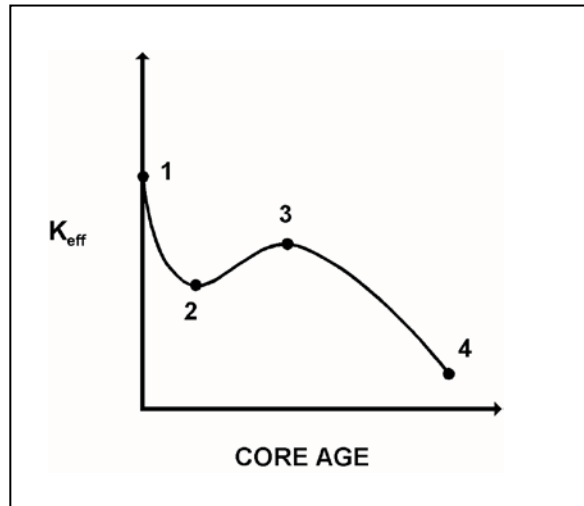D. The available NPSH is smaller than expected, but remains above the required NPSH.
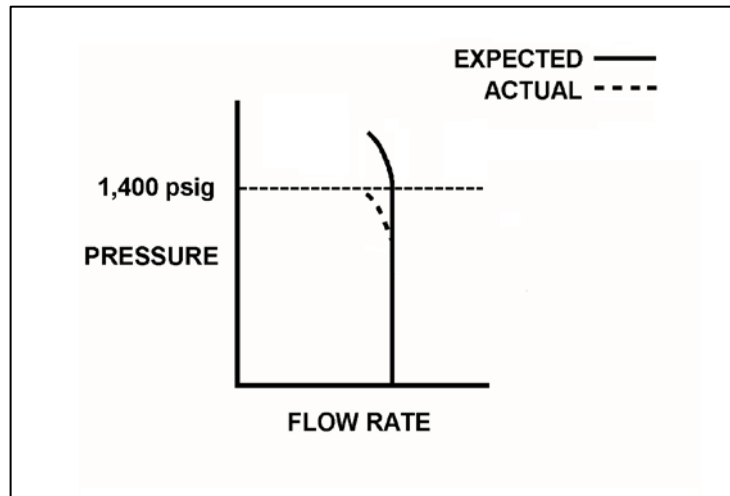
QUESTION: 6

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

The major cause for the change in K_{eff} from point 2 to point 3 is the...

A. depletion of fuel.

B. depletion of control rods.

C. burnout of burnable poisons.

D. burnout of fission product poisons.

QUESTION: 7

A nuclear power plant is operating at 100 percent power when a 200 gpm reactor vessel 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 = 800 psia
Low pressure coolant injection (LPCI) pumps = 200 psia

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

A. Only the LPCI pumps, due to pump overheating.

B. All LPCI and HPCI pumps, due to pump overheating.

C. Only the HPCI pumps, due to motor overheating.

D. All LPCI and HPCI pumps, due to motor overheating.

QUESTION: 8

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below). A differential pressure (D/P) flow detector is properly connected to instrument lines A and C. Connections B and D are capped.

If instrument line A develops a leak, flow rate indication will _____ due to a _____ measured D/P.

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

PIPE ELBOW - TOP VIEW
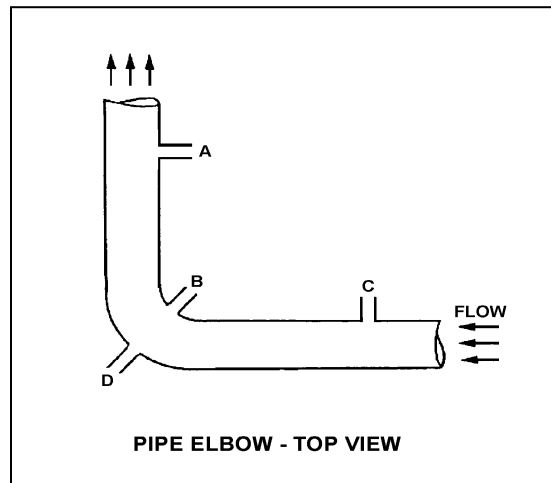
QUESTION: 9

A variable-speed centrifugal fire water pump is taking a suction on an open storage tank and discharging through a 4-inch diameter fire hose and through a nozzle located 50 feet above the pump.

Which one of the following will cause the pump to operate at shutoff head?

A. The fire hose is replaced with a 6-inch diameter fire hose.

B. The fire hose is replaced with a 2-inch diameter fire hose.

C. Pump speed is increased until steam formation at the eye of the pump prevents pump flow.

D. Pump speed is decreased until pump discharge pressure is insufficient to cause flow.

QUESTION: 10

A reactor was operating for several months at steady-state 100 percent power when a reactor scram occurred. Which one of the following lists the two factors most responsible for the value of the core neutron flux level 1 hour after the scram?

A. K_{eff} and the rate of source neutron production.

B. K_{eff} and the effective delayed neutron fraction.

C. The decay rates of the delayed neutron precursors and the rate of source neutron production.

D. The decay rates of the delayed neutron precursors and the effective delayed neutron fraction.

QUESTION: 11

Steam entering an air ejector reaches sonic velocity in the throat of a convergent-divergent nozzle. Upon entering the divergent section of the nozzle, steam velocity will _____ and steam pressure will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 12

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

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

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

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

D. Attempt to turn the valve handwheel in the open direction and verify movement.

QUESTION: 13

Water enters a positive displacement pump at 50 psig and 90°F.   What is the available net positive suction head (NPSH) for the pump?

A. 80 feet

B. 114 feet

C. 133 feet

D. 148 feet

QUESTION: 14

Quench gases are added to gas-filled radiation detectors that operate in the _____ region; the quench gases prevent a single ionization event from causing _____ in the detector gas volume.

A. ion chamber; multiple discharges

B. ion chamber; secondary ionizations

C. Geiger-Mueller; multiple discharges

D. Geiger-Mueller; secondary ionizations

QUESTION: 15

Refer to the partial drawing of two identical radial-flow centrifugal pumps in a cooling water system (see figure below).   Each pump is driven by an identical three-phase AC induction motor.

The cooling water system is being returned to service following maintenance on the pumps. Pump A was started 5 minutes ago to initiate flow in the cooling water system.

When pump B is started, which one of the following will cause the ammeter for pump B to stabilize at a higher-than-normal value for the pump configuration?

A. Pump B was initially rotating in the reverse direction.

B. There is an obstruction in the discharge piping from pump B.

C. The packing gland for pump B was overtightened since the pump last operated.

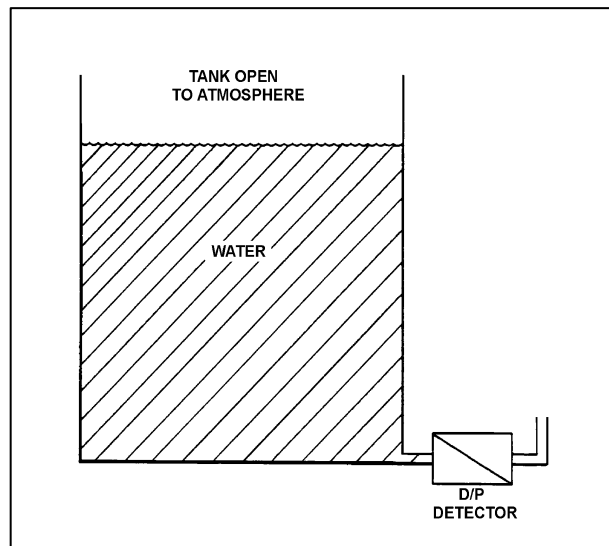D. The shaft coupling between the motor and pump for pump B was removed and <u>not</u> reinstalled.
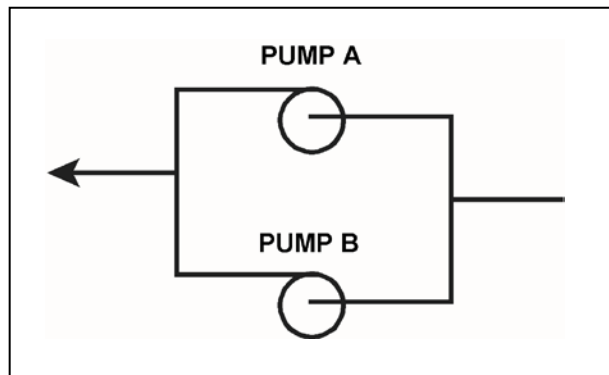
QUESTION: 16

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

If the tank contains 30 feet of water at 60°F, what is the approximate D/P sensed by the detector?

A. 7 psid

B. 13 psid

C. 20 psid

D. 28 psid

QUESTION: 17

Given the following steam parameters:

Pressure = 1,000 psia
Quality = 98 percent

The specific enthalpy of the steam would be greater if the pressure of the steam was 100 psia _____ at the <u>same</u> quality; or if the quality of the steam was 1 percent _____ at the <u>same</u> pressure.

A. higher; higher

B. higher; lower

C. lower; higher

D. lower; lower

QUESTION: 18

The nil-ductility transition temperature of the reactor vessel (RV) is the temperature...

A. above which the RV metal will elastically deform as RV pressure decreases.

B. above which the RV metal loses its ability to elastically deform as RV pressure increases.

C. below which the RV metal will elastically deform as RV pressure decreases.

D. below which the RV metal loses its ability to elastically deform as RV pressure increases.

QUESTION: 19

In a reactor operating at full power, the fuel bundle with the <u>highest</u> power always has the...

A. greatest critical power ratio.

B. greatest radial peaking factor.

C. smallest linear heat generation rate.

D. smallest maximum average planar linear heat generation rate.

QUESTION: 20

A reactor is operating at 85 percent power with control rod X-Y inserted 20 percent. Which one of the following will cause the differential rod worth of control rod X-Y to become more negative? (Assume that control rod X-Y remains 20 percent 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: 21

With xenon-135 initially at equilibrium, which one of the following power changes will produce the greater change in equilibrium xenon-135 negative reactivity?

A. 0 percent to 10 percent

B. 30 percent to 40 percent

C. 60 percent to 70 percent

D. 90 percent to 100 percent

QUESTION: 22

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

The rate of heat transfer between the lube oil and cooling water will increase if the cooling water inlet temperature _____; or if the cooling water mass flow rate _____.

A. decreases; decreases

B. decreases; increases

C. increases; decreases

D. increases; increases
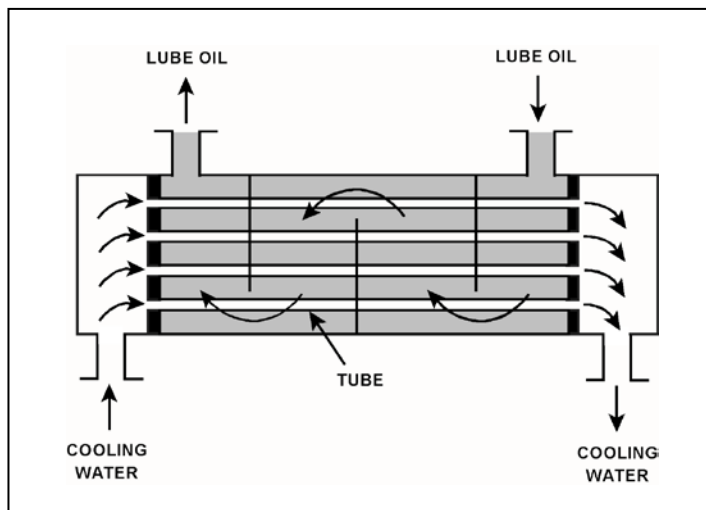
QUESTION: 23

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?   (HP = high pressure; LP = low pressure)

A. HP fluid inventory will increase.

B. Level in the surge tank will decrease.

C. Pressure in the LP system will decrease.

D. Temperature in the LP system will increase.
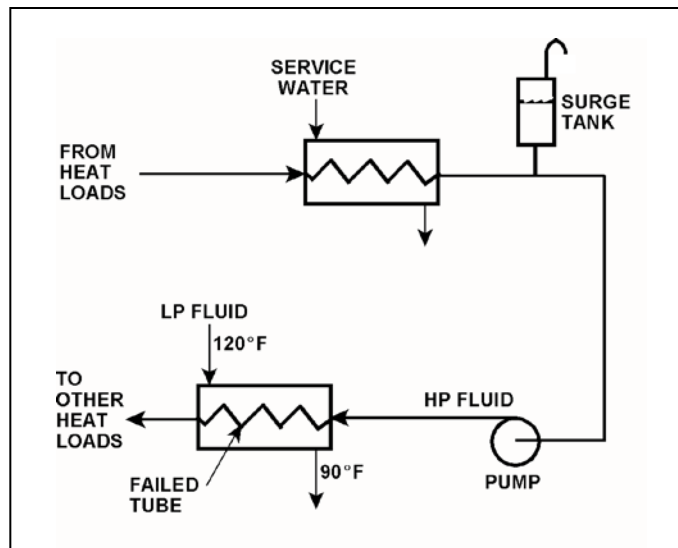
QUESTION: 24

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

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

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

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

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

QUESTION: 25

Which one of the following describes the initial reactivity effect of a moderator temperature decrease in an overmoderated reactor?

A. Positive reactivity will be added because fewer neutrons will be captured by the moderator while slowing down.

B. Positive reactivity will be added because fewer neutrons will be absorbed at resonance energies while slowing down.

C. Negative reactivity will be added because more neutrons will be captured by the moderator while slowing down.

D. Negative reactivity will be added because more neutrons will be absorbed at resonance energies while slowing down.

QUESTION: 26

A reactor was operating at steady-state 50 percent power near the beginning of a fuel cycle when a centrally-located <u>shallow</u> control rod dropped out of the core.   The reactor did <u>not</u> scram.

If the dropped control rod had been a <u>deep</u> control rod, it would have produced a _____ change in the _____.   (Assume the reactor does <u>not</u> scram.)

A. smaller; shutdown margin.

B. greater; shutdown margin.

C. smaller; radial power distribution.

D. greater; radial power distribution.

QUESTION: 27

How does the critical heat flux vary from the bottom to the top of a typical fuel bundle while operating at 100 percent power?

A. Decreases continuously.

B. Decreases, then increases.

C. Increases continuously.

D. Increases, then decreases.

QUESTION: 28

Initially, a reactor is critical at a stable power level well below the point of adding heat (POAH). When considering the following two cases, assume the reactor remains below the POAH.

    Case 1: A step addition of <u>positive</u> 1.0×10^{-4} ΔK/K.
    Case 2: A step addition of <u>negative</u> 1.0×10^{-4} ΔK/K.

The time required for reactor power to change by a factor of 10 will be greater for 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: 29

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

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

A. partially; 6 gpm

B. partially; 2 gpm

C. fully; 6 gpm

D. fully; 2 gpm

QUESTION: 30

A reactor is shutdown with a K_{eff} of 0.96 and a stable source range count rate of 50 cps when a reactor startup is commenced. Which one of the following will be the stable count rate when K_{eff} reaches 0.995?

A. 400 cps

B. 800 cps

C. 4,000 cps

D. 8,000 cps

QUESTION: 31

When performing a heat balance calculation to determine core thermal power, the measured thermal power is _____ by a value associated with the recirculation pumps; the adjustment is needed because _____ of the flow energy added to the reactor coolant by the recirculation pumps 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: 32

Given the following:

- Initially, reactor power is 1.0×10^{-3} percent and increasing with a constant period of 260 seconds.
- The turbine bypass system is maintaining reactor pressure at 1,000 psia.
- The point of adding heat is 1.0 percent power.
- The power coefficient is -1.0×10^{-4} $\Delta K/K$/percent power.
- The effective delayed neutron fraction is 0.006.
- <u>No</u> operator actions or automatic protective actions occur.

In 40 minutes, reactor power will be approximately...

A. 3 percent and stable.

B. 3 percent and increasing.

C. 10 percent and stable.

D. 10 percent and increasing.

QUESTION: 33

The shutdown margin for an operating reactor is the amount of reactivity by which a xenon-free reactor at 68°F would be subcritical if all control rods were fully...

A. withdrawn, except for an average worth control rod which remains fully inserted.

B. inserted, except for an average worth control rod which remains fully withdrawn.

C. withdrawn, except for the highest worth control rod which remains fully inserted.

D. inserted, except for the highest worth control rod which remains fully withdrawn.

QUESTION: 34

A main generator connected to a power grid has the following indications:

    300 MW
    300 MVAR (out)

What is the power factor of the main generator?

A. 0.5 leading

B. 0.5 lagging

C. 0.7 leading

D. 0.7 lagging

QUESTION: 35

A 480 VAC motor is supplied power via an electrical disconnect in series with a breaker.   Which one of the following describes the proper operations to isolate power to the motor?

A. Open the disconnect first, then the breaker.

B. Open the breaker first, then the disconnect.

C. Open the device that is closest to the motor first.

D. Open the device that is closest to the power source first.

QUESTION: 36

Refer to the drawing of two valves used in a high temperature water system (see figure below). Both valves are currently <u>closed</u>, as shown in the figure.

The valve that is more likely to become stuck due to mechanical binding as the valve cools down is number _____; and the valve that is more likely to become stuck due to a pressure lock as the valve heats up is number _____.

A.   1; 1

B.   1; 2

C.   2; 1

D.   2; 2
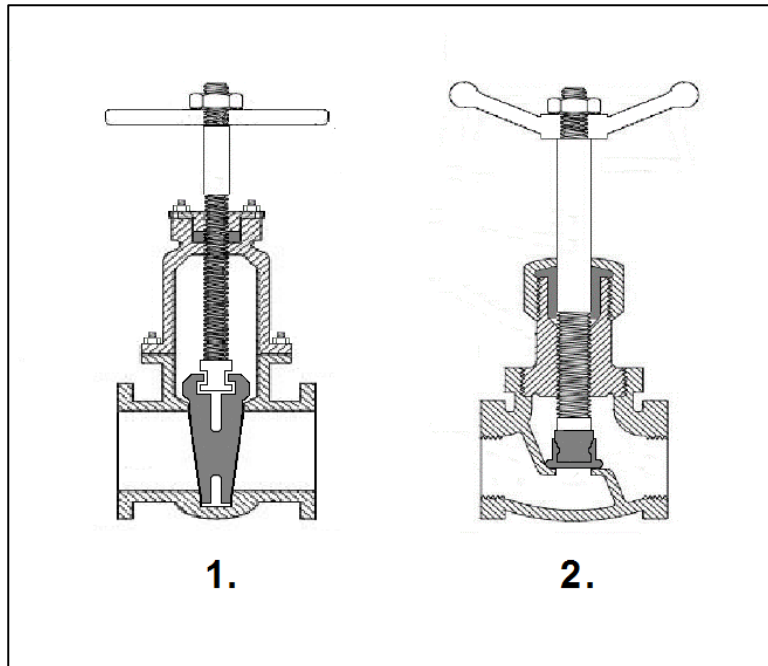
QUESTION: 37

An air-operated valve requires 3,600 pounds-force from its diaphragm actuator for proper valve operation. The diameter of the diaphragm is 12 inches.

Which one of the following is the minimum actuator air pressure needed for proper valve operation?

A. 32 psig

B. 47 psig

C. 81 psig

D. 96 psig

QUESTION: 38

A reactor scram occurred 16 hours ago following several months of operation at 100 percent power. Reactor pressure is being maintained at 1,000 psia. The source range count rate is 400 cps, and the source neutron production rate is constant. Assume that <u>no</u> operator action is taken during the next 24 hours.

During the next 24 hours, the source range count rate will…

A. increase for the entire period.

B. decrease for the entire period.

C. initially increase, and then decrease for the rest of the period.

D. initially decrease, and then increase for the rest of the period.

QUESTION: 39

Water containing dissolved sodium (Na^+) and chloride (Cl^-) ionic impurities is passing through an ion exchanger that contains only anion exchange resin. How are the ionic impurities being affected as the water flows through the ion exchanger?

A. Sodium ions are being exchanged, but the chloride ions are unaffected.

B. Chloride ions are being exchanged, but the sodium ions are unaffected.

C. Sodium ions are being exchanged, and chloride ions are being removed by filtration.

D. Chloride ions are being exchanged, and sodium ions are being removed by filtration.

QUESTION: 40

Initially, a nuclear power plant is operating at steady-state 90 percent power near the end of core life when a signal error causes the turbine control system to open the turbine steam inlet valves an additional 5 percent. Assuming the reactor does not scram, the critical power ratio will initially...

A. increase, because reactor power initially increases.

B. decrease, because reactor power initially decreases.

C. increase, because the reactor coolant latent heat of vaporization initially increases.

D. decrease, because the reactor coolant latent heat of vaporization initially decreases.

QUESTION: 41

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: 42

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. With the feedwater heater still isolated, the operators stabilized the plant at 85 percent reactor power. Compared to the initial main generator output (MW), the current main generator output (MW) is…

A. lower, because the steam cycle thermal efficiency is lower.

B. lower, because the steam mass flow rate through the main turbine is lower.

C. higher, because the steam cycle thermal efficiency is higher.

D. higher, because the steam mass flow rate through the main turbine is higher.
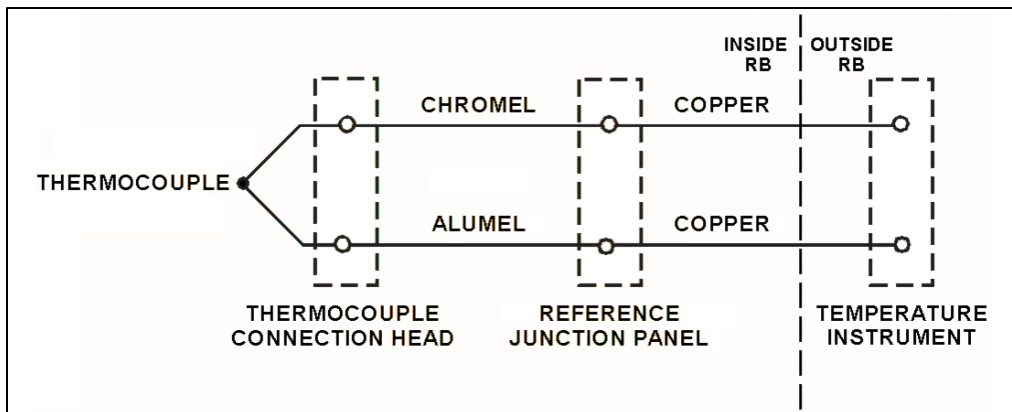
QUESTION: 43

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).

Given the following:

- The temperature instrument currently indicates 370°F.
- The reference junction temperature is constant at 120°F.
- The temperature instrument is capable of indicating 32°F to 1,000°F and has just been calibrated.

Which one of the following temperature indications will result if the chromel lead becomes disconnected from its terminal in the thermocouple connection head?

A. 32°F

B. 120°F

C. 250°F

D. 1,000°F

_

QUESTION: 44

Refer to the drawing of a differential pressure (D/P) level detection system for a reactor vessel at normal operating temperature and pressure (see figure below).

A nuclear power plant uses several differential pressure detectors like the one below to provide multiple channels of reactor vessel water level indication. A hot channel was calibrated when the reactor vessel was at normal operating temperature. A cold channel was calibrated when the reactor vessel was at 160°F.

How will the level indications on the two channels compare when the reactor vessel is at 160°F?

A. The cold channel will indicate higher than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.

B. The cold channel will indicate lower than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.

C. The cold channel will indicate higher than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.

D. The cold channel will indicate lower than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.
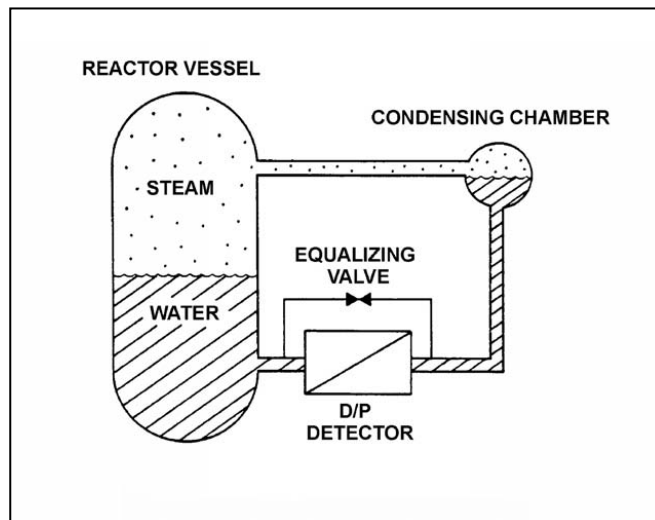
QUESTION: 45

If a main generator output breaker is closed when the generator output voltage is 90 degrees out of phase with the power grid voltage, the main generator will experience a _____ stress; if the breaker remains closed and <u>no</u> additional operator action is taken, the main generator voltage will _____ with the grid voltage.

A   minor; remain out of phase

B. minor; become locked into phase

C. potentially damaging; remain out of phase

D. potentially damaging; become locked into phase

QUESTION: 46

A nuclear power plant is operating at steady-state 90 percent power. If a turbine control system malfunction opens the turbine steam inlet valves an additional 5 percent, reactor power will initially...

A. increase, due to positive reactivity addition from the void coefficient only.

B. increase, due to positive reactivity addition from the void and moderator temperature coefficients.

C. decrease, due to negative reactivity addition from the void coefficient only.

D. decrease, due to negative reactivity addition from the void and moderator temperature coefficients.

QUESTION: 47

A reactor is operating at 3,400 MW thermal power. The linear heat generation rate (LHGR) limit is 14.7 kW/ft.

Given:

- The reactor core contains 640 fuel bundles.
- Each bundle contains 62 fuel rods, each with an active length of 12.5 feet.
- The highest total peaking factors are at the following core locations:

  Location A: 2.4
  Location B: 2.3
  Location C: 2.2
  Location D: 2.1

Which one of the following describes the operating conditions in the core relative to the LHGR limit?

A. All locations in the core are operating below the LHGR limit.

B. Location A has exceeded the LHGR limit while the remainder of the core is operating below the limit.

C. Locations A and B have exceeded the LHGR limit while the remainder of the core is operating below the limit.

D. Locations A, B, and C have exceeded the LHGR limit while the remainder of the core is operating below the limit.

QUESTION: 48

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

A. speed; air

B. speed; fuel

C. load; air

D. load; fuel

QUESTION: 49

The ideal neutron moderator has a _____ microscopic scattering cross section for thermal neutrons and a _____ density.

A. small; low

B. small; high

C. large; low

D. large; high

QUESTION: 50

Which one of the following describes how and why the void coefficient of reactivity changes as void fraction increases during a control rod withdrawal at 80 percent power?

A.   Becomes less negative, due to the increased absorption of neutrons by U-238.

B.   Becomes less negative, due to a greater fraction of neutrons lost to leakage from the core.

C.   Becomes more negative, due to the reduction in the fast fission contribution to the neutron population.

D.   Becomes more negative, due to a greater fractional loss of moderator for a one percent void increase at higher void fractions.

*** FINAL ANSWER KEY ***

NRC GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2019–BWR

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