UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2014 --FORM A

Please Print

Name: _____

Docket No.: _____

Facility: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO APPLICANT

Answer all the test items using the answer sheet provided, ensuring a single answer is marked for each test item. Each test item has equal point value. A score of at least 80 percent is required to pass this portion of the NRC operator licensing written examination. All examination materials will be collected 3 hours after the examination begins. This examination applies to a typical U.S. 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

$°C = (5/9)(°F - 32)$

$°F = (9/5)(°C) + 32$

1 kg $= 2.21$ lbm

1 ft^3_{water} $= 7.48$ gal

1 gal_{water} $= 8.35$ lbm

1 Curie $= 3.7 \times 10^{10}$ dps

QUESTION: 1

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

A. gate; gate

B. gate; globe

C. globe; gate

D. globe; globe

QUESTION: 2

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: 3

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

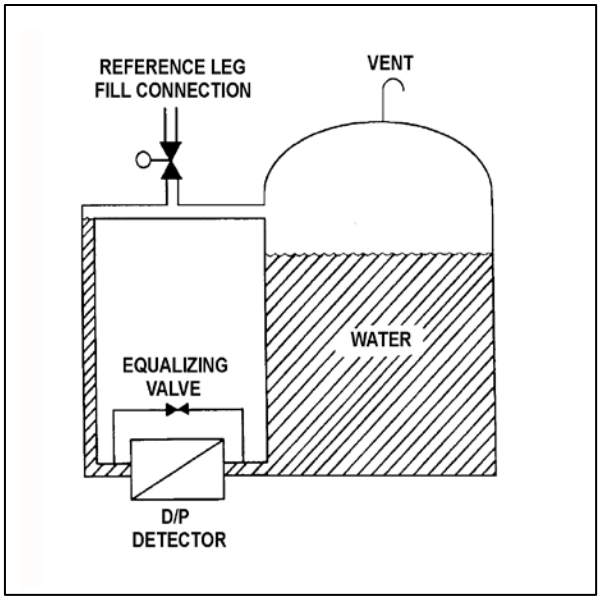
Tank water level indication will be lower than actual level when reference leg temperature is _____ than calibration conditions or when there is a break in the _____ leg of the D/P cell.

A. less; reference

B. less; variable

C. greater; reference

D. greater; variable



QUESTION: 4

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

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

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

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

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

QUESTION: 5

A properly calibrated 0 to 100 psia diaphragm pressure detector is connected to a pressurized system; the low pressure side of the detector is vented to the atmosphere. The detector is currently producing a system pressure indication of 75 psia.

If the detector diaphragm ruptures, indicated pressure will be approximately...

A. 0 psia.

B. 15 psia.

C. 60 psia.

D. 90 psia.

QUESTION: 6

Refer to the drawing of a simple thermocouple circuit (see figure below) that is calibrated for a reference junction temperature of 90°F.

Thermocouple temperature indication is currently 150°F. Indicator range is from 0°F to 2000°F.

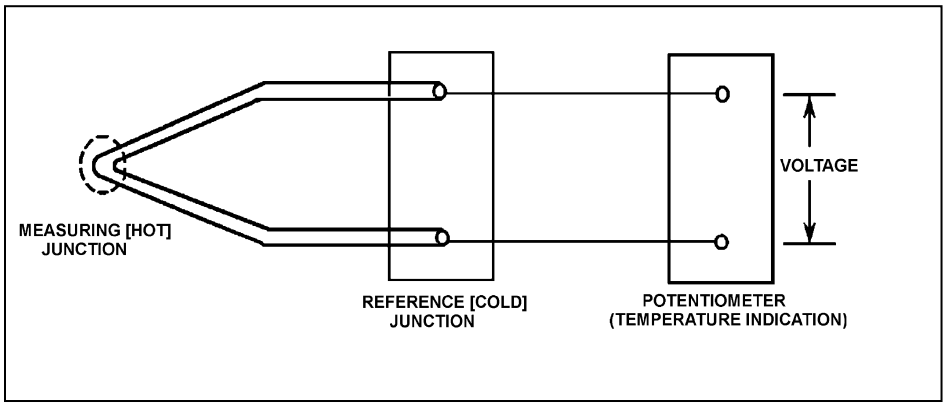
If one of the thermocouple extension wires loosens and becomes dislodged from its terminal in the reference junction panel, which one of the following temperature indications will result?

A. 0°F

B. 60°F

C. 90°F

D. 2000°F



QUESTION: 7

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

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase

QUESTION: 8

A diesel generator is supplying an isolated electrical bus with the governor operating in the isochronous mode. If a large electrical load is started on the bus, generator frequency will...

A. initially decrease, then increase and stabilize below the initial value.

B. initially decrease, then increase and stabilize at the initial value.

C. initially decrease, then increase and stabilize above the initial value.

D. remain constant during and after the load start.

QUESTION: 9

Refer to the drawing of a flow control valve (see figure below) that is located in the makeup water supply line to a water storage tank.

The flow control valve is positioned by a tank level controller that can maintain a stable water level anywhere between 10 percent above and 10 percent below the setpoint.

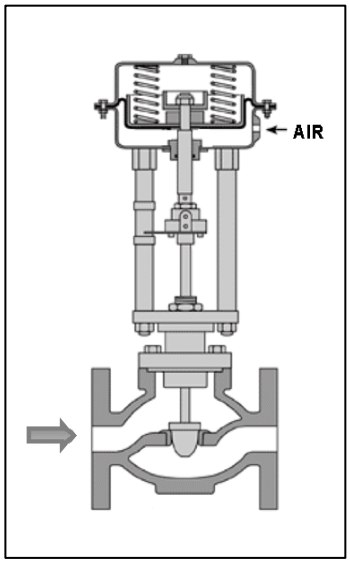
Which one of the following describes the characteristics of the tank level controller?

A. Direct acting with proportional only control.

B. Direct acting with proportional plus integral control.

C. Reverse acting with proportional only control.

D. Reverse acting with proportional plus integral control.



QUESTION: 10

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

A. A firefighter inadvertently severs the fire hose.

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

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

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

QUESTION: 11

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

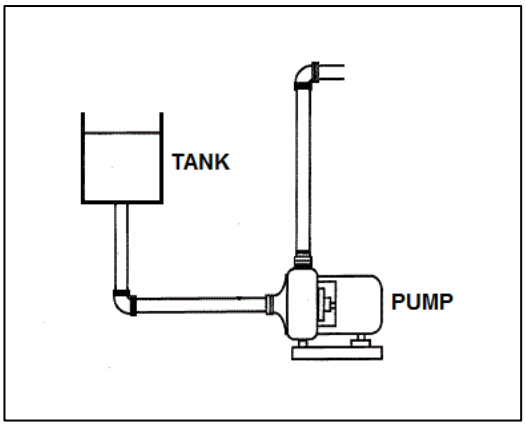
If the temperature of the water in the storage tank and pump suction piping increases to 80ºF, with the accompanying water expansion, the suction head for the pump will _____; and the available net positive suction head for the pump will _____.

A. increase; increase

B. increase; decrease

C. remain the same; increase

D. remain the same; decrease



QUESTION: 12

If the speed of a positive displacement pump is increased, the available net positive suction head will _____; and the pump will operate _____ cavitation.

A increase; closer to

B. decrease; further from

C. increase; further from

D. decrease; closer to

QUESTION: 13

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

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

A. Axial-flow centrifugal

B. Radial-flow centrifugal

C. Rotary positive displacement

D. Reciprocating positive displacement

QUESTION: 14

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

22 KV
60 Hertz
575 MW
100 MVAR (out)

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

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

QUESTION: 15

Which one of the following describes the relationship between the current drawn by an AC induction motor and the amount of heat generated in the motor windings?

A. Heat generation is directly proportional to the current.

B. Heat generation is proportional to the cube of the current.

C. Heat generation is proportional to the square of the current.

D. Heat generation is proportional to the square root of the current.

QUESTION: 16

The rate of heat transfer between two liquids in a heat exchanger will increase if the… (Assume specific heats do <u>not</u> change.)

A. inlet temperature of the hotter liquid decreases by 20°F.

B. inlet temperature of the colder liquid increases by 20°F.

C. flow rates of both liquids decrease by 10 percent.

D. flow rates of both liquids increase by 10 percent.

QUESTION: 17

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

The heat exchanger is operating with the following initial parameters:

Cooling water inlet temperature ($T_{cw\text{-}in}$) = 75°F
Cooling water outlet temperature ($T_{cw\text{-}out}$) = 95°F
Oil inlet temperature ($T_{oil\text{-}in}$) = 150°F
Oil outlet temperature ($T_{oil\text{-}out}$) = 110°F

Air leakage into the heat exchanger causes some of the heat exchanger tubes to become uncovered. As a result, $T_{cw\text{-}out}$ decreases to 89°F. Assume the inlet temperatures, mass flow rates, and specific heats of both fluids do <u>not</u> change.

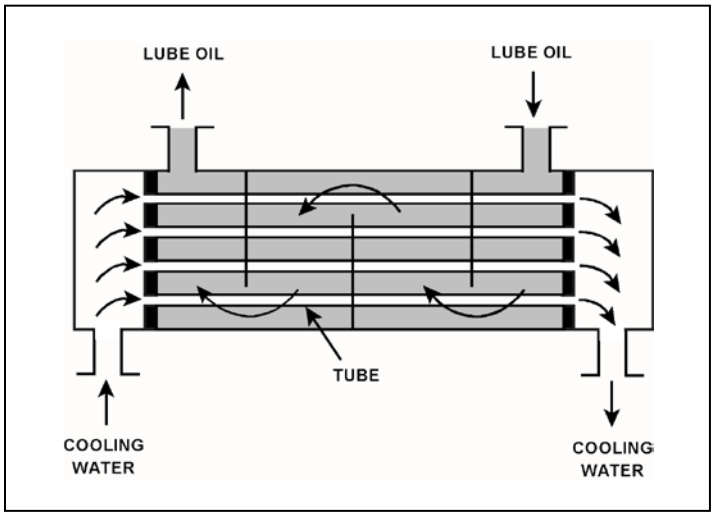
Which one of the following will be the resulting temperature of the lube oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 116°F

B. 122°F

C. 130°F

D. 138°F



QUESTION: 18

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

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

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

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

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

QUESTION: 19

A nuclear power plant is operating at 70 percent steady-state power level when the temperature of the reactor coolant letdown passing through a boron-saturated mixed-bed ion exchanger is decreased by 20°F.

As a result, the boron concentration in the effluent of the ion exchanger will _____ because the ability of the ion exchanger to remove boron atoms has _____.

A. increase; increased

B. increase; decreased

C. decrease; increased

D. decrease; decreased

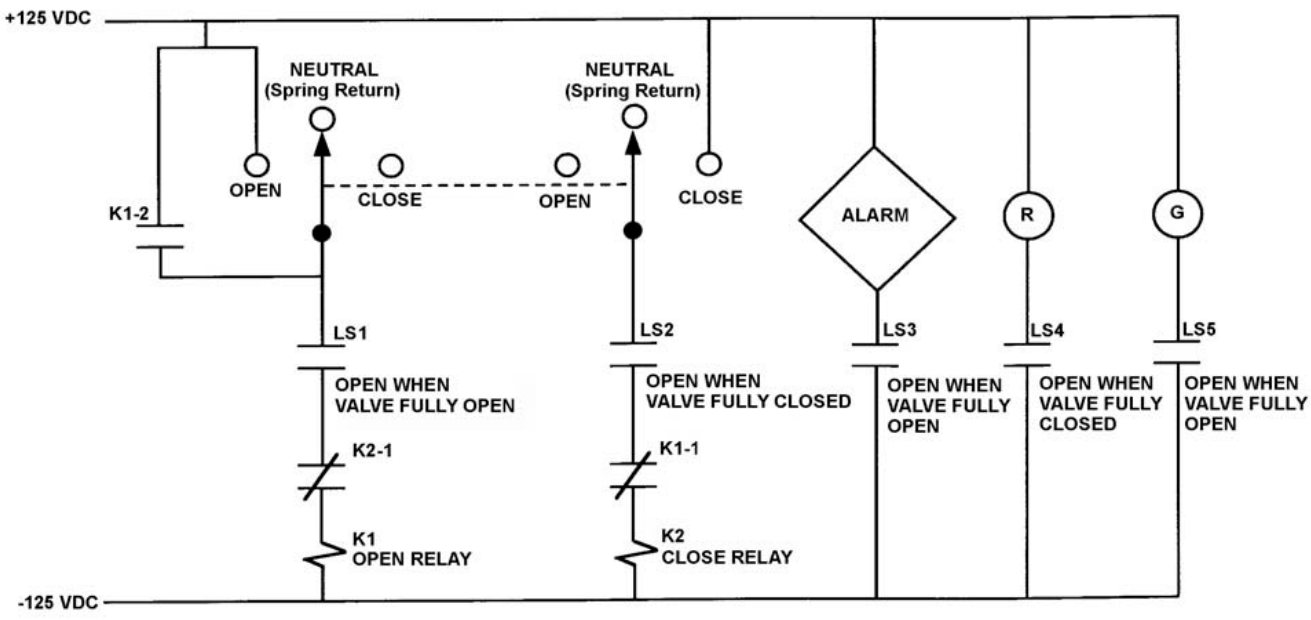
QUESTION: 20

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

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

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

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



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 21

Which one of the following will cause the most damage to the contact surfaces of a main generator output breaker?

A. The main generator output breaker automatically trips open on a loss of offsite power while the main generator is operating at its minimum rated load.

B. The main generator output breaker automatically trips open on a loss of offsite power while the main generator is operating at its maximum rated load.

C. An operator attempts to close the main generator output breaker with the generator and power grid frequencies matched but with voltages 180 degrees out of phase.

D. An operator attempts to close the main generator output breaker with the generator and power grid voltages in phase but with generator frequency 0.5 percent higher than power grid frequency.

QUESTION: 22

Refer to the simplified drawing of an electrical distribution system showing 7.2 KV switchgear, step-down transformers, and 480 V motor control centers (MCCs) (see figure below).

The high voltage side of each step-down transformer has a remote-operated disconnect to allow transformer maintenance while keeping the other transformers in service. The control circuit for each disconnect is position-interlocked with the associated MCC feeder breaker.

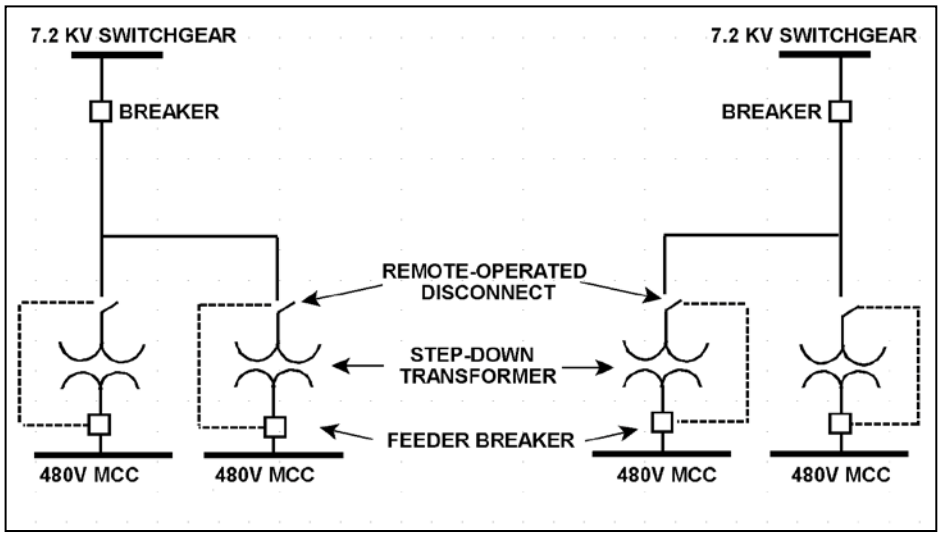
Which one of the following describes the purpose served by the interlock?

A. Prevent damage to the disconnect.

B. Prevent damage to the transformer.

C. Prevent damage to the feeder breaker.

D. Prevent damage to the 480V MCC.



QUESTION: 23

Which one of the following is the process that produces the majority of delayed neutrons in an operating reactor?

A. A thermal neutron is absorbed by a fuel nucleus. After a period of time, the nucleus fissions and releases a delayed neutron.

B. A thermal neutron is absorbed by a fuel nucleus. The fuel nucleus fissions. During the decay process of the fission products, a delayed neutron is emitted.

C. A fast neutron is absorbed by a fuel nucleus. After a period of time, the nucleus fissions and releases a delayed neutron.

D. A fast neutron is absorbed by a fuel nucleus. The fuel nucleus fissions. During the decay process of the fission products, a delayed neutron is emitted.

QUESTION: 24

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

A. 0.988

B. 0.992

C. 0.996

D. Cannot be determined without additional information.

QUESTION: 25

Which one of the following neutron sources undergoes the most significant source strength reduction during the hour immediately following a reactor trip from steady-state 100 percent power?

A. Spontaneous fission reactions

B. Photo-neutron reactions

C. Alpha-neutron reactions

D. Transuranic isotope decay

QUESTION: 26

How does increasing the reactor coolant boron concentration affect the moderator temperature coefficient (MTC) in an overmoderated reactor?

A. The initially negative MTC becomes more negative.

B. The initially negative MTC becomes less negative.

C. The initially positive MTC becomes more positive.

D. The initially positive MTC becomes less positive.

QUESTION: 27

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

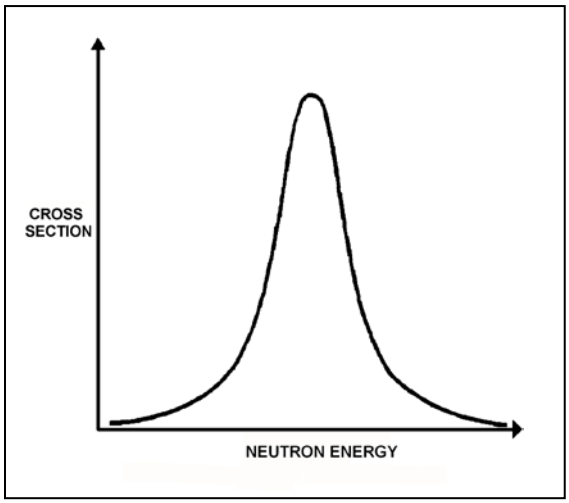
If reactor power is increased to 90 percent over the next few hours, the curve will become _____; and the percentage of the core neutron population lost to resonance capture by U-238 will _____.

A. shorter and broader; increase

B. shorter and broader; decrease

C. taller and more narrow; increase

D. taller and more narrow; decrease



QUESTION: 28

A reactor has been operating at 100 percent power for three weeks shortly after a refueling outage. All control rods are fully withdrawn. Which one of the following describes why most of the power is being produced in the lower half of the core?

A. The fuel loading in the lower half of the core contains a higher U-235 enrichment.

B. Reactor coolant boron is adding more negative reactivity in the upper half of the core.

C. There is a greater concentration of Xe-135 in the upper half of the core.

D. The moderator temperature coefficient of reactivity is adding more negative reactivity in the upper half of the core.

QUESTION: 29

If core quadrant power distribution (sometimes called quadrant power tilt or azimuthal tilt) is maintained within design limits, which one of the following conditions is most likely?

A. Axial power distribution is within design limits.

B. Radial power distribution is within design limits.

C. Nuclear instrumentation is indicating within design accuracy.

D. Departure from nucleate boiling ratio is within design limits.

QUESTION: 30

A reactor was operating at 100 percent power for 8 weeks when a reactor trip occurred. The reactor was critical 6 hours later and power was increased to 100 percent over the next 6 hours.

What was the status of xenon-135 concentration when power reached 100 percent?

A. Increasing toward an equilibrium value.

B. Burning out faster than it is being produced.

C. Increasing toward a peak value.

D. At equilibrium.

QUESTION: 31

Fourteen hours after a reactor trip from 100 percent power with equilibrium xenon-135, the concentration of xenon-135 will be _____ than the 100 percent power equilibrium xenon-135 concentration; and xenon-135 will have added a net _____ reactivity since the trip.

A. less; positive

B. less; negative

C. greater; positive

D. greater; negative

QUESTION: 32

Compared to adding boric acid to the reactor coolant system (RCS) during forced circulation, adding boric acid during natural circulation requires _____ time to achieve complete mixing in the RCS; and after complete mixing occurs, a 1 ppm increase in RCS boron concentration during natural circulation will cause a/an _____ change in reactivity for a given reactor coolant temperature.

A. less; equal

B. less; smaller

C. more; equal

D. more; smaller

QUESTION: 33

During a reactor startup, the first reactivity addition caused the stable source range count rate to increase from 20 cps to 40 cps. The second reactivity addition caused the stable count rate to increase from 40 cps to 160 cps.

Which one of the following statements accurately compares the two reactivity additions?

A. The first reactivity addition was larger.

B. The second reactivity addition was larger.

C. The first and second reactivity additions were equal.

D. There is not enough information given to compare the reactivity values.

QUESTION: 34

Which one of the following describes the prompt jump and the change in stable source range count rate resulting from a short control rod withdrawal with K_{eff} at 0.95 as compared to an identical control rod withdrawal with K_{eff} at 0.99? (Assume the reactivity additions are equal, and the reactor remains subcritical.)

A. The prompt jump in count rate will be the same, and the increase in stable count rate will be the same.

B. The prompt jump in count rate will be greater with K_{eff} at 0.99, but the increase in stable count rate will be the same.

C. The prompt jump in count rate will be the same, but the increase in stable count rate will be greater with K_{eff} at 0.99.

D. The prompt jump in count rate will be greater with K_{eff} at 0.99, and the increase in stable count rate will be greater with K_{eff} at 0.99.

QUESTION: 35

During an initial fuel load, the subcritical multiplication factor increases from 1.0 to 8.0. What is the current value of K_{eff}?

A. 0.125

B. 0.5

C. 0.75

D. 0.875

QUESTION: 36

A reactor is critical below the point of adding heat when a fully withdrawn control rod fully inserts into the core. Assuming no operator or automatic actions, core neutron flux will slowly decrease to...

A. zero.

B. an equilibrium value less than the source neutron flux.

C. an equilibrium value greater than the source neutron flux.

D. a slightly lower value, then slowly return to the initial value.

QUESTION: 37

Which one of the following is arranged from the highest pressure to the lowest pressure?

A. 2 psig, 12 inches Hg absolute, 8 psia

B. 2 psig, 18 inches Hg absolute, 8 psia

C. 12 psia, 20 inches Hg absolute, 2 psig

D. 12 psia, 30 inches Hg absolute, 2 psig

QUESTION: 38

Consider a saturated steam-water mixture at 500°F with a quality of 90 percent. If the pressure of the mixture is decreased with no heat gain or loss, the temperature of the mixture will _____; and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; increase

B. decrease; decrease

C. remain the same; increase

D. remain the same; decrease

QUESTION: 39

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

A. The enthalpy increases during the entire pressure increase.

B. The enthalpy initially increases and then decreases.

C. The enthalpy decreases during the entire pressure increase.

D. The enthalpy initially decreases and then increases.

QUESTION: 40

A nuclear power plant is operating with the following main steam parameters at the main turbine steam inlet valves:

Pressure = 900 psia
Quality = 99 percent

The main turbine steam chest pressure is 300 psia. Assuming an ideal throttling process, what is the quality of the steam in the steam chest?

A. 100 percent

B. 98 percent

C. 88 percent

D. 87 percent

QUESTION: 41

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

A. greater; lower

B. greater; higher

C. less; lower

D. less; higher

QUESTION: 42

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

A. The mass flow rate of the mixture.

B. The specific volume of the mixture.

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

D. No additional information is needed.

QUESTION: 43

A steam generator transient causes main steam pressure to increase although the actual mass flow rate of steam remains constant. If the main steam flow instrument is <u>not</u> density compensated, the increased main steam pressure will cause indicated steam mass flow rate to...

A. increase, due to a higher steam velocity.

B. increase, due to a greater steam density.

C. decrease, due to a lower steam velocity.

D. decrease, due to a reduced steam density.

QUESTION: 44

The power range nuclear instruments have been adjusted to 100 percent based on a calculated heat balance. 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 10°F lower 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 lower than actual feedwater flow rate.

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

QUESTION: 45

A reactor is operating at steady-state 100 percent power near the end of a fuel cycle with all control rods fully withdrawn. At what axial location in a typical fuel assembly will the maximum departure from nucleate boiling ratio occur?

A. At the top of the fuel assembly.

B. At the bottom of the fuel assembly.

C. Between the bottom and midplane of the fuel assembly.

D. Between the midplane and the top of the fuel assembly.

QUESTION: 46

During a plant cooldown and depressurization with forced circulation, reactor coolant system (RCS) loop flow indications and reactor coolant pump (RCP) motor current indications become erratic. These abnormal indications are most likely caused by...

A. RCP cavitation.

B. RCP runout.

C. RCS loop water hammer.

D. RCS hot leg saturation.

QUESTION: 47

Refer to the drawing of a section of pipe that contains flowing subcooled water (see figure below).

Given:

- Pressure at P_1 is 26 psig.
- Pressure at P_2 is 34 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 8 psig.

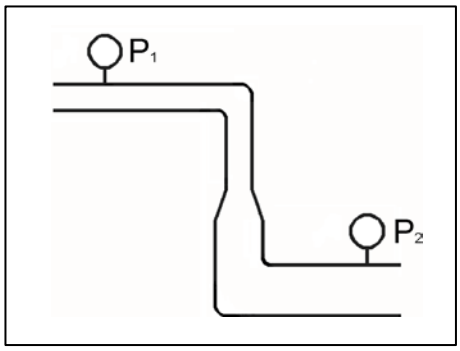
The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

A. 2 psig; left to right

B. 2 psig; right to left

C. 4 psig; left to right

D. 4 psig; right to left



QUESTION: 48

A reactor is shut down at normal operating temperature and pressure with all reactor coolant pumps stopped. Stable natural circulation cooling is in progress with 50°F of RCS subcooling. Which one of the following, if increased, will not affect natural circulation flow rate?

A. Reactor coolant pressure

B. Time after reactor trip

C. Feedwater flow rate

D. Steam generator pressure

QUESTION: 49

A reactor is operating at 80 percent power near the middle of a fuel cycle. All 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 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: 50

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

Which reactor will have the higher reactor vessel nil-ductility transition temperature?

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

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

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

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

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

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

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