UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
DECEMBER 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. boiling water reactor (BWR) nuclear power plant.

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

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

_____

Applicant's Signature

RULES AND 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

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

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

1 Btu $= 778$ ft-lbf

$℃ = (5/9)(°F - 32)$

$°F = (9/5)(℃) + 32$

1 kg $= 2.21$ lbm

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

1 $gal_{water} = 8.35$ lbm

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

QUESTION: 1

Subcooled water is flowing through a throttle valve in an open system. The initial steady-state conditions for the throttle valve are as follows:

Inlet pressure = 60 psia
Outlet pressure = 44 psia
Flow rate = 800 gpm

Four hours later, the current steady-state conditions for the throttle valve are as follows:

Inlet pressure = 51 psia
Outlet pressure = 42 psia
Flow rate = 600 gpm

Which one of the following could be responsible for the difference between the initial and current conditions for the throttle valve?

A. The throttle valve was opened more.

B. The throttle valve was closed more.

C. Another valve, located upstream of the throttle valve, was partially closed.

D. Another valve, located downstream of the throttle valve, was partially closed.

QUESTION: 2

Refer to the drawing of four air-operated valves (see figure below). **Note:** The valve actuators may be shown with or without air pressure applied.

Given:

- The direction of system flow is from left to right when the valves are open.
- The internal components for each valve are identical except for the orientation of the valve disk and seat.
- The valve actuators exert the same force on the attached valve stem for a given applied air pressure.

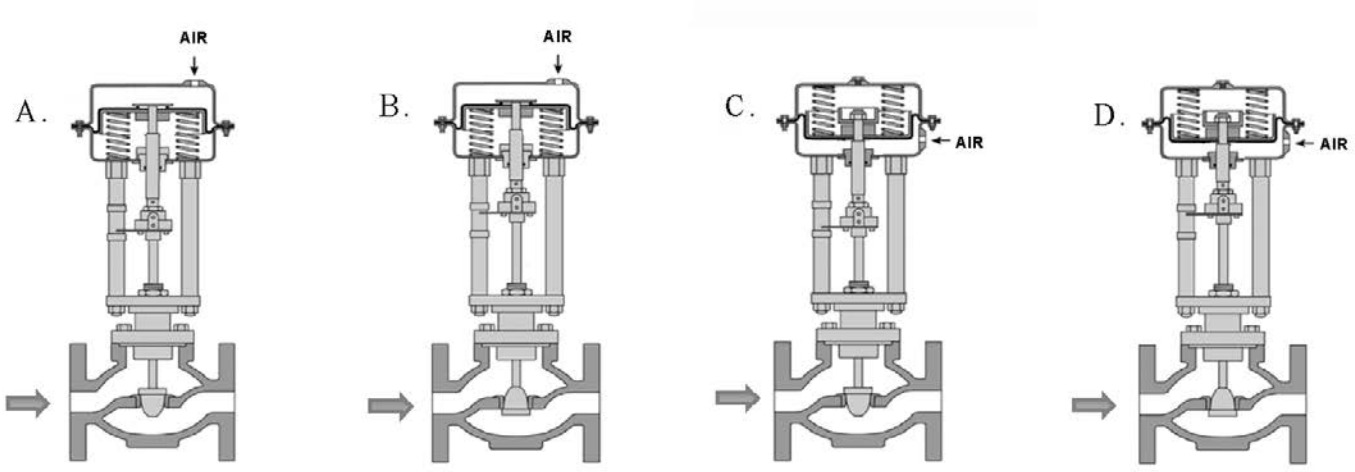
If each actuator is vented, which valve disk will remain closed with the most force?

A. A.

B. B.

C. C.

D. D.



QUESTION: 3

Consider a 3-inch gate valve and a 3-inch globe valve in the same flowing water system application. If both valves are fully open, the globe valve produces the _____ head loss and the _____ flow rate.

A. larger; larger

B. larger; smaller

C. smaller; larger

D. smaller; smaller

QUESTION: 4

Refer to the drawing in which water is flowing through a convergent-divergent venturi (see figure below). The pipe diameters at P1 and P2 are equal.

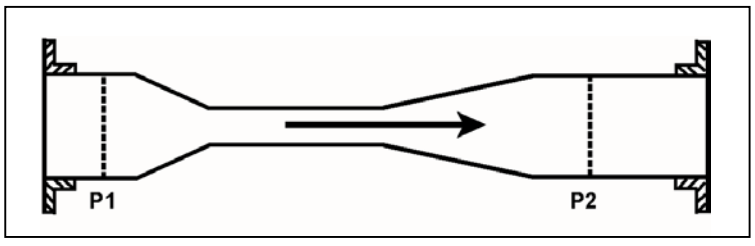
Compared to the conditions at the inlet of the venturi (P1), the pressure at the outlet of the venturi (P2) has _____; and water velocity at the outlet of the venturi has _____. (Assume "real" conditions.)

A. remained the same; remained the same

B. remained the same; decreased slightly

C. decreased slightly; remained the same

D. decreased slightly; decreased slightly



QUESTION: 5

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

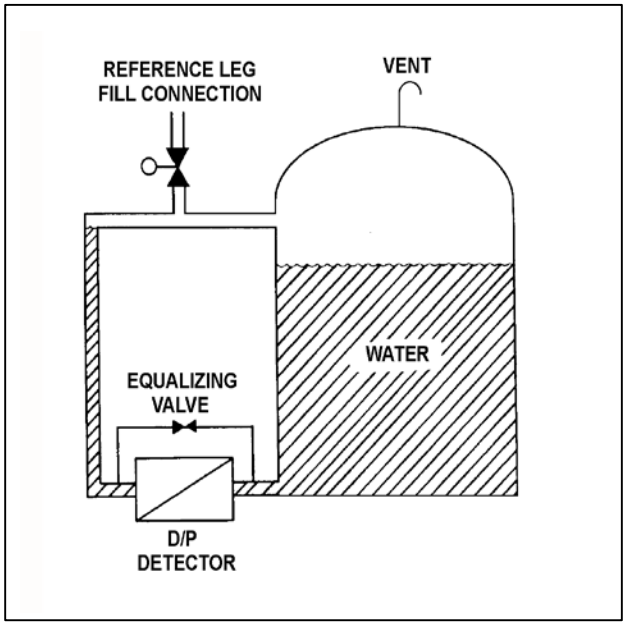
The level detector is being used in a level control system that was calibrated to maintain tank level at 80 percent when the tank temperature was 100°F. If tank temperature gradually increases and stabilizes at 150°F, the level control system will cause <u>actual</u> tank level to...

A. remain stable at 80 percent.

B. increase and stabilize above 80 percent.

C. oscillate and then stabilize at 80 percent.

D. decrease and stabilize below 80 percent.



QUESTION: 6

For proper operation of a thermocouple circuit, the reference junction temperature…

A. must be less than the measuring junction temperature.

B. must be greater than the measuring junction temperature.

C. may be less than, greater than, or equal to the measuring junction temperature.

D. may be less than or greater than, but not equal to, the measuring junction temperature.

QUESTION: 7

A gas-filled radiation detector that operates in the Geiger-Mueller region of the gas ionization curve is being used in a constant radiation field. If the detector's operating voltage is increased by 50 volts while remaining in the Geiger-Mueller region, the detector's count rate indication will _____; and the ability of the detector to detect gamma radiation will _____.

A. increase; improve

B. increase; remain the same

C. remain the same; improve

D. remain the same; remain the same

QUESTION: 8

A proportional controller is being used to control the water level in a tank. Initially, the controller input and output signals are both stable at 50 percent of their full range. If the controller input signal increases to 60 percent, the controller output signal will increase to 90 percent.

What is the gain for this controller?

A. 0.25

B. 0.5

C. 2.0

D. 4.0

QUESTION: 9

If the turbine shaft speed signal received by a typical turbine governor control system fails high during turbine startup, the turbine governor will cause turbine speed to...

A. increase until an upper limit is reached or the turbine trips on overspeed.

B. increase until the mismatch with the turbine speed demand signal is nulled.

C. decrease until a lower limit is reached or turbine steam flow is isolated.

D. decrease until the mismatch with the turbine speed demand signal is nulled.

QUESTION: 10

Refer to the drawing of a centrifugal pump with a recirculation line (see figure below).

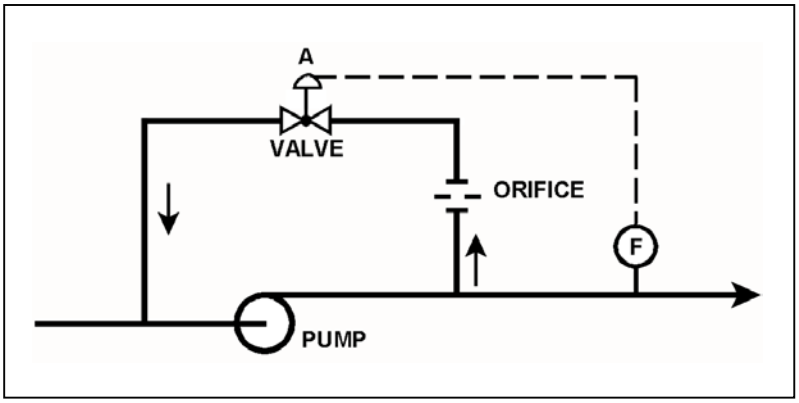
The flowpath through valve A is designed to...

A. prevent pump runout by creating a recirculation flowpath.

B. provide a small flow rate through the pump during shutoff head conditions.

C. direct a small amount of water to the pump suction to raise available net positive suction head.

D. prevent the discharge piping from exceeding design pressure during no-flow conditions.



QUESTION: 11

A centrifugal pump is taking suction from an open water storage tank. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges to a pressurized system.

Given:

- The storage tank is filled to a level of 26 feet with 60°F water.
- The pump requires 45 feet of net positive suction head.
- The pump is currently operating at 50 gpm.

Which one of the following describes the current pump status, and how the pump flow rate will be affected as the level in the storage tank decreases?

A. The pump is currently cavitating; pump flow rate will decrease continuously as tank level decreases.

B. The pump is currently cavitating; pump flow rate will remain about the same until the tank empties.

C. The pump is currently <u>not</u> cavitating; pump flow rate will gradually decrease with tank level, and then rapidly decrease when the tank empties.

D. The pump is currently <u>not</u> cavitating; pump flow rate will gradually decrease with tank level, and then rapidly decrease when cavitation begins before the tank empties.

QUESTION: 12

An AC motor-driven centrifugal pump was just started. During the start, motor current remained peaked for 6 seconds before decreasing to standard running current. Normally, the starting current peak lasts about 4 seconds.

Which one of the following could have caused the extended starting current peak?

A. The pump shaft was seized and did not turn.

B. The pump was initially rotating slowly in the reverse direction.

C. The pump discharge check valve was stuck closed and did not open.

D. The pump was initially air bound, and then primed itself after 6 seconds of operation.

QUESTION: 13

Which one of the following describes the proper location for a relief valve that will be used to prevent exceeding the design pressure of a positive displacement pump and associated piping?

A. On the pump suction piping upstream of the suction isolation valve.

B. On the pump suction piping downstream of the suction isolation valve.

C. On the pump discharge piping upstream of the discharge isolation valve.

D. On the pump discharge piping downstream of the discharge isolation valve.

QUESTION: 14

An air-cooled AC induction motor is initially operating at steady-state conditions, producing a work output of 50 hp. A reduction in cooling air flow rate to the motor causes the average stator winding temperature to increase by 20ºF. To maintain a 50 hp work output at the higher stator winding temperature, the voltage applied to the motor must be _____ because the stator winding resistance has _____.

A. increased; increased

B. increased; decreased

C. decreased; increased

D. decreased; decreased

QUESTION: 15

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

22 KV
60 Hertz
575 MW
100 MVAR (in)

Which one of the following contains a combination of minor adjustments to the main generator voltage regulator and speed control setpoints such that <u>each</u> adjustment will cause the main generator to operate at a power factor closer to 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: 16

Reduced heat transfer performance in a water-to-water heat exchanger will result from...

A. tube wall thinning.

B. gas collection in the shell.

C. turbulent flow in the tubes.

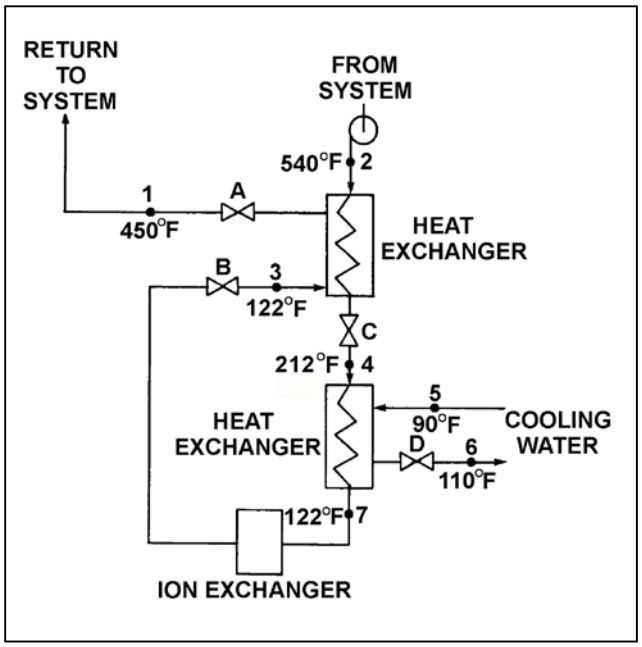
D. increased ΔT between fluids.

QUESTION: 17

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

Valves A, B, and D are fully open and valve C is 50 percent open. If valve C is opened to 100 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: 18

A reactor is shut down at 400 psia when all forced core coolant flow is lost. Which one of the following will enhance natural circulation inside the reactor vessel (RV)?

A. Decrease RV pressure to 300 psia.

B. Increase RV pressure to 500 psia.

C. Decrease RV water level to just above the top of the core.

D. Increase RV water level to just above the steam separators.

QUESTION: 19

The decontamination factor for ionic impurities of a demineralizer can be expressed as...

A. Inlet Conductivity minus Outlet Conductivity.

B. Outlet Conductivity minus Inlet Conductivity.

C. Inlet Conductivity divided by Outlet Conductivity.

D. Outlet Conductivity divided by Inlet Conductivity.

QUESTION: 20

A condensate demineralizer differential pressure (D/P) gauge indicates 4.0 psid at 50% flow rate. Over the next two days plant power changes have caused condensate flow rate to vary between 25% and 100%.

Which one of the following combinations of condensate flow rate and demineralizer D/P, observed during the power changes, indicates an increase in the accumulation of insoluble corrosion products in the demineralizer?

	Condensate Flow Rate	Demineralizer D/P (psid)
A.	100%	15.0
B.	75%	9.0
C.	60%	5.0
D.	25%	2.0

QUESTION: 21

Refer to the drawing of a valve motor control circuit (see figure below) for a valve that is currently fully open and has a 10-second stroke time.

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

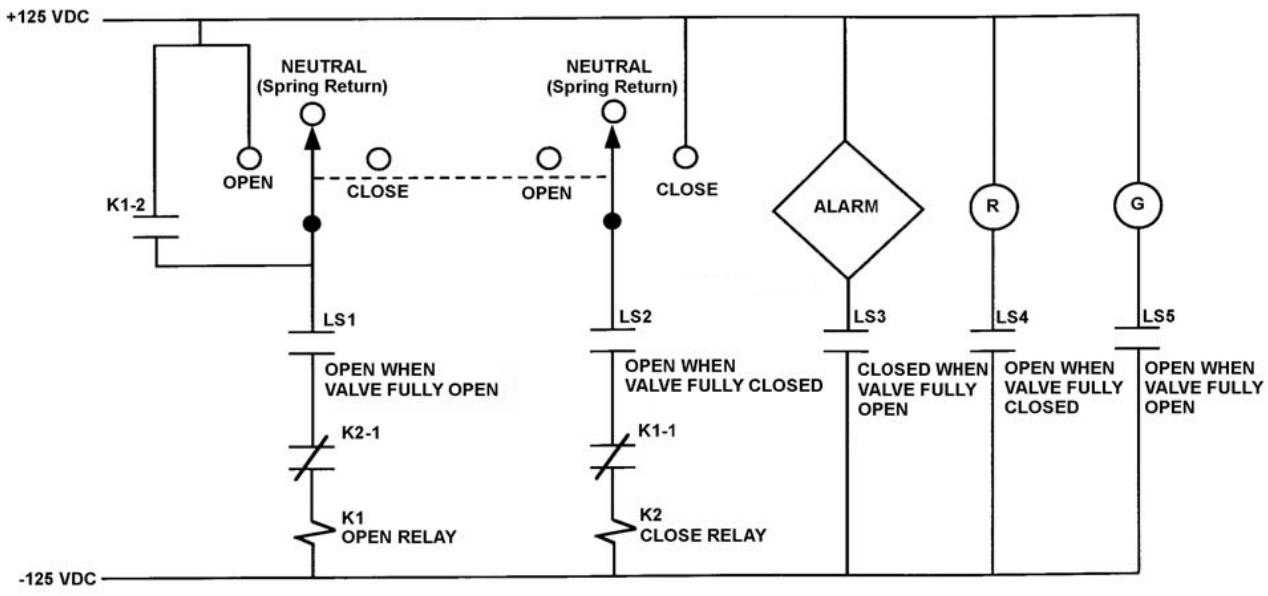
The operator takes the control switch to CLOSE. Two seconds later, after verifying the valve is closing, the operator releases the control switch. Which one of the following describes the valve motor control circuit alarm response after the switch is released?

A. The alarm will actuate after approximately 8 seconds.

B. The alarm will <u>not</u> actuate until additional operator action is taken.

C. The alarm will continue to actuate for approximately 8 seconds.

D. The alarm will continue to actuate until additional operator action is taken.



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 22

If a main generator output breaker is closed when the generator output voltage is 5 degrees out of phase with the power grid voltage, the main generator will experience a _____ stress; if the breaker remains closed and no 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: 23

Which one of the following describes the energy level of a thermal neutron in a reactor operating at full power?

A. The kinetic energy of the neutron has decreased until it is in equilibrium with its surroundings.

B. The potential energy of the neutron has decreased to nearly zero as the neutron approaches equilibrium with its surroundings.

C. The kinetic energy of the neutron has decreased sufficiently to allow the neutron to be resonantly absorbed by U-238.

D. The potential energy of the neutron has decreased to a level that will allow the neutron to be absorbed by U-235.

QUESTION: 24

A reactor was initially operating at steady-state 100 percent power near the middle of a fuel cycle when it was shut down and then cooled down to 200°F over a three-day period.

Given the following absolute values of reactivities added during the shutdown and cooldown, assign a (+) or (–) as appropriate and choose the current value of core reactivity.

Control rods	=	( ) 12.50% ΔK/K
Voids	=	( ) 3.50% ΔK/K
Xenon	=	( ) 2.50% ΔK/K
Fuel temperature	=	( ) 2.00% ΔK/K
Moderator temperature	=	( ) 0.50% ΔK/K

A. -3.0% ΔK/K

B. -4.0% ΔK/K

C. -8.0% ΔK/K

D. -9.0% ΔK/K

QUESTION: 25

A reactor is stable at 75 percent power with the following conditions:

Total control rod worth	=	-0.0753 ΔK/K
Shutdown margin	=	-0.0042 ΔK/K
Effective delayed neutron fraction	=	0.0058
Effective prompt neutron fraction	=	0.9942

How much positive reactivity must be added to make the reactor <u>prompt</u> critical?

A. 0.0042 ΔK/K

B. 0.0058 ΔK/K

C. 0.0753 ΔK/K

D. 0.9942 ΔK/K

QUESTION: 26

A reactor is shut down near the middle of a fuel cycle with the shutdown cooling system in service. The initial reactor vessel water temperature is 160ºF. In this condition, the reactor is undermoderated.

Then, a heatup and pressurization is performed to bring the reactor to normal operating temperature and pressure. The reactor remains subcritical.

During the heatup, K_{eff} will…

A. increase continuously.

B. decrease continuously.

C. initially increase, and then decrease.

D. initially decrease, and then increase.

QUESTION: 27

Which one of the following describes why more power is produced in the lower half of a reactor core (versus the upper half) that has been operating at 100 percent power for several weeks near the beginning of a fuel cycle?

A. Xenon concentration is smaller in the lower half of the core.

B. The moderator-to-fuel ratio is smaller in the lower half of the core.

C. Control rods are adding less negative reactivity in the lower half of the core.

D. The void coefficient is adding less negative reactivity in the lower half of the core.

QUESTION: 28

During a reactor startup:

- Reactor power is stable at the point of adding heat,
- The main steam isolation valves are open,
- Reactor vessel pressure is stable at 600 psig, and
- The steam bypass system pressure setpoint is 920 psig.

Then, control rods are manually withdrawn for 5 seconds. When conditions stabilize, reactor power will be _____; and reactor vessel pressure will be _____. (Assume the reactor does not scram.)

A. higher; the same

B. higher; higher

C. the same; the same

D. the same; higher

QUESTION: 29

A control rod located at notch position _____ in the core would be considered a _____ control rod.

A. 36; deep

B. 36; intermediate

C. 12; intermediate

D. 12; deep

QUESTION: 30

A reactor has been operating at 30 percent power for three hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Increasing toward equilibrium.

C. Decreasing toward an upturn.

D. Decreasing toward equilibrium.

QUESTION: 31

Given:

- A reactor was operating at 100 percent power for 6 weeks when a scram occurred.
- A reactor startup was performed and criticality was reached 16 hours after the scram.
- Two hours later, the reactor is currently at 30 percent power.

If no operator actions occur during the next hour, reactor power will _____ because the xenon-135 concentration is _____.

A. increase; decreasing

B. increase; increasing

C. decrease; decreasing

D. decrease; increasing

QUESTION: 32

Burnable poisons are placed in a reactor to...

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

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

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

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

QUESTION: 33

At the beginning of a reactor startup, K_{eff} was 0.97 and the stable source range count rate was 40 cps. After several incremental control rod withdrawals, the stable source range count rate was 400 cps. The next incremental control rod withdrawal resulted in a stable source range count rate of 600 cps. What is the current K_{eff}?

A. 0.98

B. 0.988

C. 0.998

D. There is <u>not</u> enough information given to calculate the current K_{eff}.

QUESTION: 34

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

A. -0.01% ΔK/K

B. -0.06% ΔK/K

C. -0.10% ΔK/K

D. -0.60% ΔK/K

QUESTION: 35

A nuclear power plant is initially operating at steady-state 60 percent power when a main steamline break occurs that releases a constant 5 percent of rated main steam flow. The plant stabilizes as follows:

- No operator or automatic protective actions occur.
- Automatic pressure control returns reactor pressure to its initial value.
- Feedwater injection temperature remains the same.

Compared to the initial operating conditions, current reactor power is approximately _____; and current turbine power is approximately _____.

A. the same; 5 percent lower

B. the same; the same

C. 5 percent higher; 5 percent lower

D. 5 percent higher; the same

QUESTION: 36

A nuclear power plant was operating at steady-state 100 percent power when one recirculation pump tripped. Reactor power decreased and stabilized at a lower power level. Which one of the following reactivity coefficients caused the initial decrease in reactor power?

A. Void coefficient

B. Pressure coefficient

C. Moderator temperature coefficient

D. Fuel temperature (Doppler) coefficient

QUESTION: 37

Refer to the drawing of two water storage tanks with four differential pressure (D/P) level detectors (see figure below).

The tanks are identical and are being maintained at 2 psig overpressure, the same constant water level, and a temperature of 60°F. They are surrounded by atmospheric pressure.

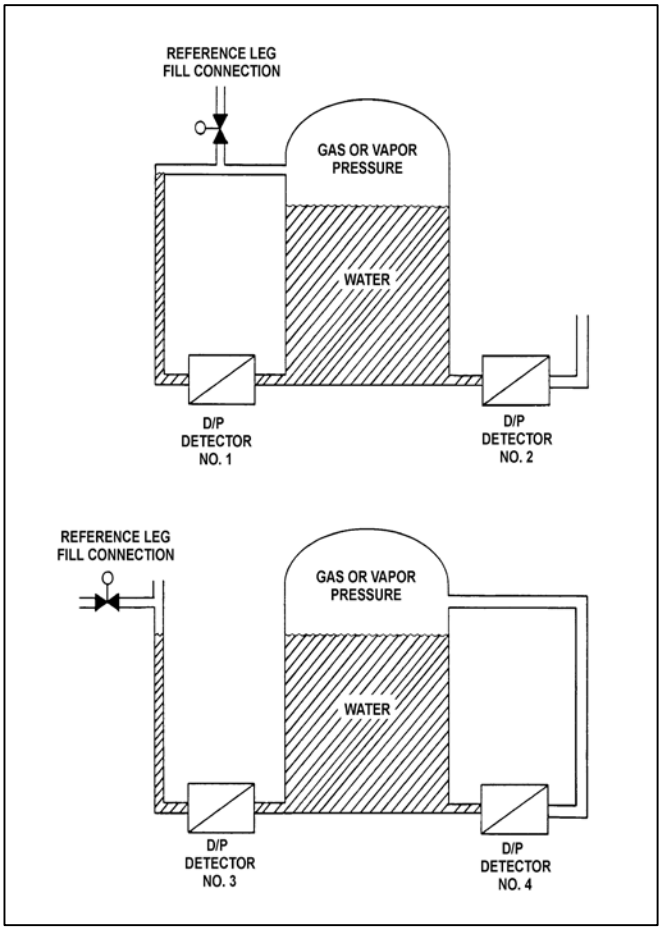
If a leak in the top of each tank causes a complete loss of overpressure, which detector(s) will produce a lower level indication?

A. No. 1 only

B. No. 2 only

C. No. 1 and 4

D. No. 2 and 3



QUESTION: 38

Which one of the following is the approximate temperature of a saturated steam-water mixture that has an enthalpy of 1,150 Btu/lbm and a quality of 95 percent?

A. 220°F

B. 270°F

C. 360°F

D. 440°F

QUESTION: 39

A nuclear power plant is operating at 100 percent power. Which one of the following describes how and why main condenser pressure will change if condenser cooling water flow rate increases significantly?

A. Decreases, because main condenser saturation temperature decreases.

B. Decreases, because main condenser condensate subcooling increases.

C. Increases, because main condenser saturation temperature decreases.

D. Increases, because main condenser condensate subcooling increases.

QUESTION: 40

A nuclear power plant was initially operating at steady-state 85 percent reactor power when the extraction steam to a high pressure feedwater heater was 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: 41

Which one of the following describes pump head?

A. The fluid energy contained at the inlet of a pump.

B. The energy added by a pump in excess of shutoff head.

C. The fluid energy required to ensure a pump does not cavitate.

D. The energy added by a pump to increase fluid pressure or velocity.

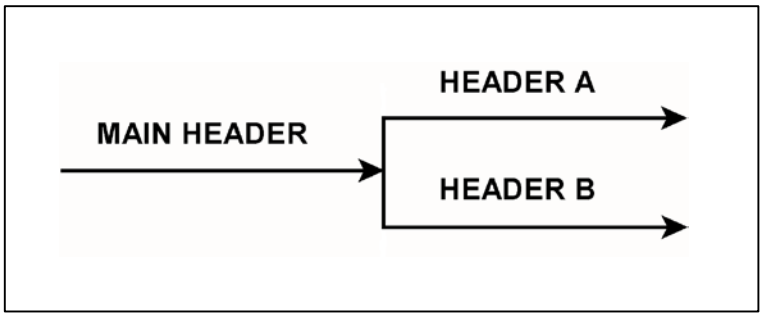
QUESTION: 42

Refer to the drawing of a main water header that splits into two parallel headers (see figure below).

Header A has a 2-inch diameter and header B has a 4-inch diameter. The velocity of the water in both headers is the same.

If the main water header has a flow rate of 500 gpm, what is the approximate flow rate in each of the parallel headers?

	Header A (gpm)	Header B (gpm)
A.	100	400
B.	125	375
C.	167	333
D.	200	300



QUESTION: 43

A counterflow lube oil heat exchanger is in operation when the cooling water flow rate is reduced to one-half its original value. Which one of the following will decrease as a result?

A. Lube oil outlet temperature

B. Cooling water outlet temperature

C. Lube oil differential temperature

D. Cooling water differential temperature

QUESTION: 44

A reactor is operating at steady-state 100 percent power when recirculation flow is decreased from 100 percent to 80 percent. During the flow reduction, the boiling boundary will move _____ in the core because each pound-mass of water flowing through the core is required to remove _____ heat from the fuel rods.

A. upward; less

B. upward; more

C. downward; less

D. downward; more

QUESTION: 45

Reactors A and B are operating at steady-state 100 percent. The reactors are identical except that reactor A has core orifices and reactor B does not. Both reactors have the same power distribution and core mass flow rate.

Compared to the outer fuel bundles in reactor B, the outer fuel bundles in reactor A will have the _____ critical power and the _____ coolant flow rate.

A. lower; lower

B. lower; higher

C. higher; lower

D. higher; higher

QUESTION: 46

A reactor is operating at 100 percent power when a loss of offsite power results in a reactor scram and a loss of forced core coolant flow. Several minutes later, the occurrence of natural circulation flow will be indicated by differential _____ across the core plate and coolant flow through the _____ pumps.

A. temperature; recirculation

B. temperature; jet

C. pressure; recirculation

D. pressure; jet

QUESTION: 47

Which one of the following parameters is limited to protect against fuel rod failure from brittle fracture when emergency cooling is initiated during a loss of coolant accident?

A. Linear heat generation rate (LHGR)

B. Average planar linear heat generation rate (APLHGR)

C. Critical power ratio (CPR)

D. Fraction of limiting critical power ratio (FLCPR)

QUESTION: 48

For what operational condition does the flow biasing correction factor (K_f) adjust the minimum critical power ratio?

A. Operation at less than rated steam flow rate.

B. Operation at greater than rated steam flow rate.

C. Operation at less than rated core flow rate.

D. Operation at greater than rated core flow rate.

QUESTION: 49

A nuclear power plant is operating at 60 percent reactor power. Which one of the following will result in the highest critical power ratio? (Assume neutron flux distribution does not change.)

A. A 25 percent power decrease using only control rods.

B. A 25 percent power decrease using only recirculation flow.

C. A 25 percent power increase using only control rods.

D. A 25 percent power increase using only recirculation flow.

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, and why?

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 *****

DECEMBER 2014 NRC GENERIC FUNDAMENTALS EXAMINATION
BOILING WATER REACTOR - ANSWER KEY

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