UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
MARCH 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

°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

Refer to the drawing of a spring-loaded air-operated valve (see figure below) in which the solenoid is shown energized.

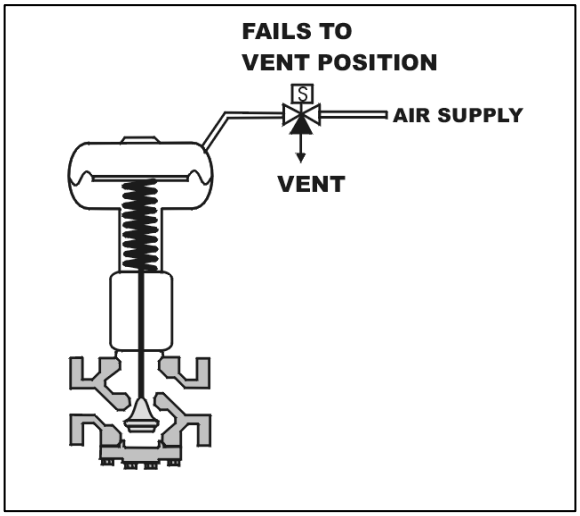
Which one of the following will be the final valve position following a loss of electrical power to the solenoid?

A. Midposition

B. Closed

C. As is

D. Open



QUESTION: 2

Which one of the following is not a generally accepted method for locally verifying that a valve is open?

A. Observe local flow rate instrumentation.

B. Check the local valve position indicator indicates OPEN.

C. Turn the valve operator in the close direction and verify that some movement occurs.

D. Attempt to turn the valve operator in the open direction and verify that no movement occurs.

QUESTION: 3

A typical motor-operated valve has been returned to service following a complete maintenance overhaul of the valve and actuator. When the valve was remotely opened and closed to verify operability, the measured valve stroke time in each direction was 15 seconds, which is shorter than normal for this valve.

Which one of the following could have caused the shorter stroke time?

A. The valve position limit switches were removed and were not reinstalled.

B. The valve torque limit switches were misadjusted to open at twice their normal setpoints.

C. The valve was packed with improved packing material having a lower friction coefficient.

D. The valve stem packing gland was overtightened after the packing material was replaced.

QUESTION: 4

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

Flow rate = 500 gpm
Tap A pressure = 40 psia
Tap B pressure = 36 psia

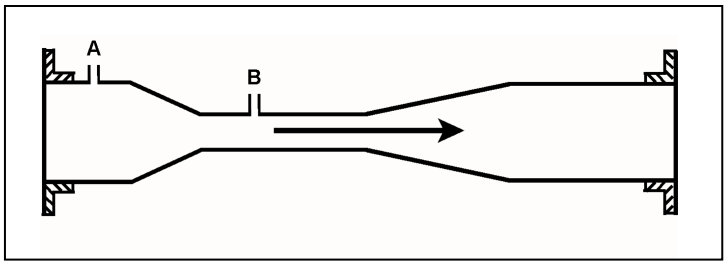
When flow rate is increased to 750 gpm, the pressure at tap A increases to 68 psia. What is the new pressure at tap B?

A. 66 psia

B. 62 psia

C. 59 psia

D. 52 psia



QUESTION: 5

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

Assume that the initial temperature of the reference leg and the water in the tank is 100°F, and that reference leg temperature does not change.

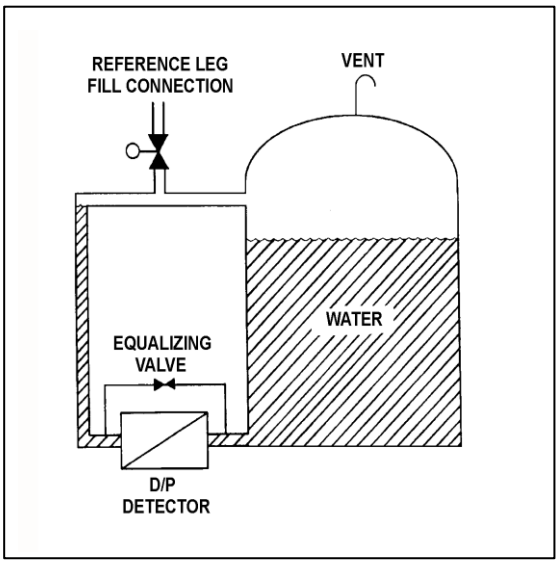
If the temperature of the water in the tank increases by 20°F, the D/P sensed by the detector will _____ if the _____ of the water in the tank is constant.

A. decrease; level

B. decrease; mass

C. remain the same; level

D. remain the same; mass



QUESTION: 6

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume that the pulse height discrimination setpoint does not change.

If the detector voltage is increased but maintained within the proportional region, count rate indication will increase because...

A. a single neutron- or gamma-induced ionizing event will result in multiple pulses inside the detector.

B. the ratio of the number of neutron-induced pulses to gamma-induced pulses inside the detector will increase.

C. the positive space charge effect will increase and promote the collection of both gamma- and neutron-induced pulses.

D. all detector pulses will increase in amplitude and previously uncounted gamma pulses will be added to the total count rate.

QUESTION: 7

A Geiger-Mueller detector with a "pancake" probe (often called a frisker) is being used to monitor workers leaving a radiologically controlled area for contamination. The probe is equipped with a mica window. The background detector count rate is 20 cpm.

As one individual's shoe is scanned, the detector reading increases to 200 cpm. When a sheet of paper is placed between the probe and the shoe, the detector reading decreases to 60 cpm. Which one of the following is indicated by the decrease in the detector reading?

A. The contamination contains beta particles.

B. The contamination contains alpha particles.

C. The contamination does <u>not</u> contain beta particles.

D. The contamination does <u>not</u> contain alpha particles.

QUESTION: 8

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 increased, 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: 9

Refer to the drawing of a flyball-weight mechanical speed governor (see figure below).

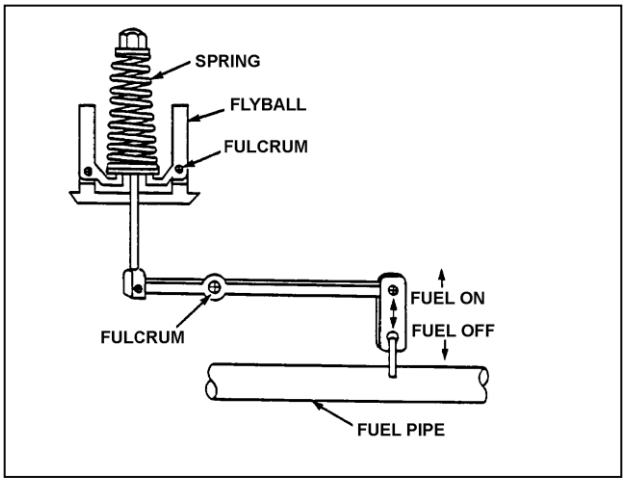
In a flyball-weight mechanical speed governor, the purpose of the spring on the flyball mechanism is to _____ centrifugal force by driving the flyballs _____.

A. counteract; outward

B. aid; inward

C. counteract; inward

D. aid; outward



QUESTION: 10

A centrifugal pump is taking suction on an open storage tank that has been filled to a level of 40 feet with 10,000 gallons of 60°F water. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges to a lake.

Given:

- The pump is currently operating at its design flow rate of 200 gpm and a total developed head of 150 feet.
- The pump requires 4 feet of net positive suction head.

How will the centrifugal pump flow rate be affected as the water storage tank level decreases?

A. Flow rate will remain constant until the pump begins to cavitate at a tank level of about 4 feet.

B. Flow rate will remain constant until the pump becomes air bound when the tank empties.

C. Flow rate will gradually decrease until the pump begins to cavitate at a tank level of about 4 feet.

D. Flow rate will gradually decrease until the pump becomes air bound when the tank empties.

QUESTION: 11

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

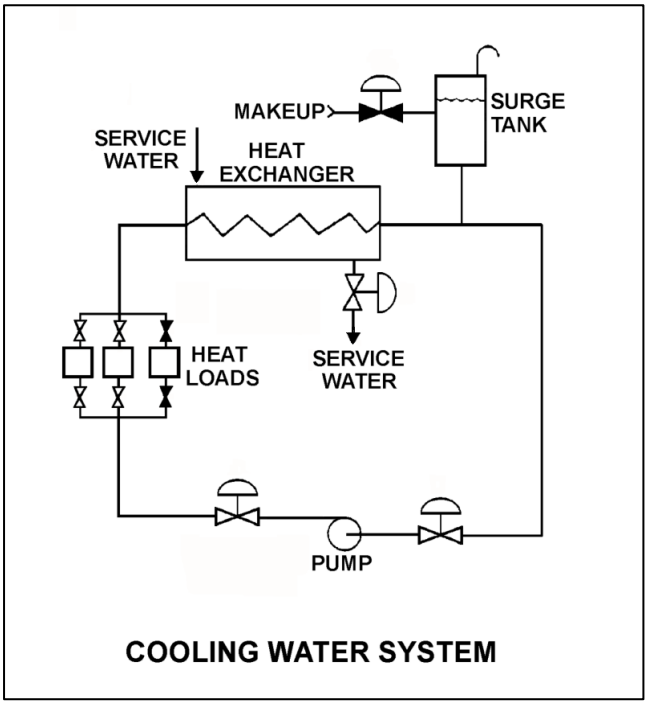
The pump is unable to achieve its rated volumetric flow rate due to cavitation. Which one of the following will enable the pump to achieve a higher volumetric flow rate before cavitation occurs?

A. Decrease the surge tank water level.

B. Increase the service water flow rate to the heat exchanger.

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

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



COOLING WATER SYSTEM

QUESTION: 12

A rotary positive displacement pump (PDP) is being used to supply water to a piping system. The PDP is driven by an AC induction motor. The initial parameters are:

System pressure = 500 psig
PDP flow rate = 50 gpm
PDP motor current = 40 amps

After several hours, the PDP motor speed is increased such that the new PDP flow rate is 100 gpm. If system pressure does not change, what is the approximate value of the PDP motor current at the 100 gpm flow rate?

A. 80 amps

B. 160 amps

C. 320 amps

D. 640 amps

QUESTION: 13

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.

A. closed; closed

B. closed; open

C. open; closed

D. open; open

QUESTION: 14

A radial flow centrifugal cooling water pump is being powered by a 480 VAC induction motor. If the motor input voltage slowly decreases from 480 VAC to 450 VAC, the pump flow rate will _____; and the motor current will _____. (Assume the motor does not stall.)

A. decrease; increase

B. decrease; decrease

C. remain the same; increase

D. remain the same; decrease

QUESTION: 15

What is the significance of a 0.8 power factor when describing the output of a generator?

A. 80 percent of the generator output is being converted to useful power.

B. 80 percent of the generator output is being used by reactive loads.

C. The generator is operating at 80 percent of its maximum rated output.

D. The generator is 80 percent efficient at converting mechanical power to electrical power.

QUESTION: 16

Why is proper venting of a shell-and-tube heat exchanger important?

A. An air bubble reduces the heat transfer coefficient of the heat exchanger.

B. An air bubble causes pressure transients within the tubes as heat load changes.

C. An air bubble will cause thermal shock as it moves through the heat exchanger.

D. An air bubble will cause corrosion in the heat exchanger.

QUESTION: 17

A steam-driven turbine exhausts to a condenser. If the condenser vacuum improves, the turbine exhaust pressure will _____, and the turbine power output will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 18

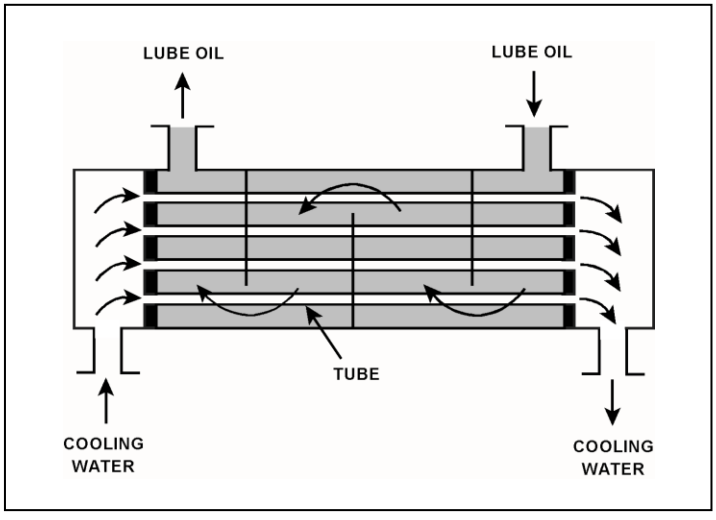
Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature = 130°F
Cooling water inlet temperature = 70°F

Given that cooling water mass flow rate is greater than lube oil mass flow rate, which one of the following pairs of heat exchanger outlet temperatures is <u>not</u> possible? (Assume both fluids have the same specific heat.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	105°F
B.	90°F	100°F
C.	110°F	95°F
D.	110°F	85°F



QUESTION: 19

What adverse effect occurs due to channeling in a demineralizer?

A. Increased demineralizer outlet conductivity, because much of the resin is essentially bypassed.

B. Loss of resin, due to agitation resulting from increased fluid velocity through the demineralizer.

C. Resin dryout and cracking, because much of the resin is essentially bypassed.

D. Resin damage, due to the increased velocity of fluid through the demineralizer.

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 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.	40%	3.0
D.	25%	1.0

QUESTION: 21

The main generator output breaker was just closed to connect the main generator to the main transformer. Just before the breaker was closed, the following parameter values existed:

Main Generator	Main Transformer
20,000 volts	20,050 volts
60.0 Hz	59.9 Hz

With no additional operator action, the main generator stabilized with the following parameter values:

25 MW
15 MVAR (in)

Now consider this following alternate set of parameters values:

Main Generator	Main Transformer
20,020 volts	20,050 volts
60.1 Hz	59.9 Hz

If the alternate set of parameter values had existed just before the breaker was closed, the resulting main generator MW value would have been _____; and the resulting main generator MVAR (in) value would have been _____.

A. smaller; larger

B. smaller; smaller

C. larger; larger

D. larger; smaller

QUESTION: 22

A 480 VAC motor control center supplies a load through a breaker and a manual disconnect switch. Which one of the following sequences will provide the greatest level of personnel safety when deenergizing the load for maintenance and when reenergizing the load after the maintenance?

	DEENERGIZING	REENERGIZING
A.	Open breaker first	Shut breaker first
B.	Open breaker first	Shut disconnect switch first
C.	Open disconnect switch first	Shut breaker first
D.	Open disconnect switch first	Shut disconnect switch first

QUESTION: 23

A neutron that is released 1.0×10^{-10} seconds after the associated fission event is classified as a _____ fission neutron.

A. delayed

B. prompt

C. thermal

D. spontaneous

QUESTION: 24

Reactors A and B are identical except that reactor A is operating near the beginning of a fuel cycle (BOC) and reactor B is operating near the end of a fuel cycle (EOC). Both reactors are operating at 100 percent power.

Which reactor would have the smaller K_{eff} five minutes after a reactor scram?

A. Reactor A, because the control rods will add more negative reactivity near the BOC.

B. Reactor A, because the power coefficient is more negative near the BOC.

C. Reactor B, because the control rods will add more negative reactivity near the EOC.

D. Reactor B, because the power coefficient is more negative near the EOC.

QUESTION: 25

A reactor is critical well below the point of adding heat during a plant startup. A small amount of positive reactivity is then added to the core, and a stable positive reactor period is established.

With the stable positive reactor period, the following power levels are observed:

Time	Power Level
0 sec	3.16×10^{-7} percent
90 sec	1.0×10^{-5} percent

Which one of the following will be the reactor power level at time = 120 seconds?

A. 3.16×10^{-5} percent

B. 5.0×10^{-5} percent

C. 6.32×10^{-5} percent

D. 1.0×10^{-4} percent

QUESTION: 26

Which one of the following describes a situation where an increase in moderator temperature can add positive reactivity?

A. At low moderator temperatures, an increase in moderator temperature can reduce neutron leakage from the core sufficiently to add positive reactivity.

B. At low moderator temperatures, an increase in moderator temperature can reduce neutron capture by the moderator sufficiently to add positive reactivity.

C. At high moderator temperatures, an increase in moderator temperature can reduce neutron leakage from the core sufficiently to add positive reactivity.

D. At high moderator temperatures, an increase in moderator temperature can reduce neutron capture by the moderator sufficiently to add positive reactivity.

QUESTION: 27

As fuel temperature increases, the resonance absorption peaks exhibited by U-238 will _____ in height, and will _____ in width.

A. decrease; increase

B. decrease; decrease

C. increase; increase

D. increase; decrease

QUESTION: 28

If a control rod is moved from position 22 to position 12, it is being...

A. inserted 30 inches.

B. withdrawn 30 inches.

C. inserted 60 inches.

D. withdrawn 60 inches.

QUESTION: 29

A reactor is initially critical below the point of adding heat (POAH) during a reactor startup. If control rods are manually withdrawn for 5 seconds, reactor power will...

A. increase to a stable critical power level below the POAH.

B. increase temporarily, then decrease and stabilize at the original value.

C. increase to a stable critical power level at the POAH.

D. increase temporarily, then decrease and stabilize below the original value.

QUESTION: 30

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 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: 31

A reactor is initially operating at 100 percent power with equilibrium xenon-135. Power level is decreased to 75 percent over a one-hour period and stabilized. No subsequent operator actions are taken.

Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 30 hours after the power change?

A. Less than 75 percent and increasing slowly.

B. Less than 75 percent and decreasing slowly.

C. Greater than 75 percent and increasing slowly.

D. Greater than 75 percent and decreasing slowly.

QUESTION: 32

At the beginning of a fuel cycle (BOC), the control rods are inserted relatively deep into the core at 100 percent power. At the end of a fuel cycle (EOC), the control rods are nearly fully withdrawn at 100 percent power.

Which one of the following is the primary reason for the change in the full power control rod position?

A. Reactivity from the power defect is much less at EOC.

B. Reactivity from the void coefficient is much greater at EOC.

C. The excess reactivity in the core is much less at EOC.

D. The integral control rod worth is much greater at EOC.

QUESTION: 33

During a reactor startup, positive reactivity addition X caused the stable source range count rate to increase from 20 cps to 40 cps. Later in the startup, after several other additions of positive reactivity, positive reactivity addition Y caused the stable source range count rate to increase from 320 cps to 640 cps.

Which one of the following statements describes how the magnitudes of the two positive reactivity additions (X and Y) compare?

A. Reactivity addition X was several times greater in magnitude than reactivity addition Y.

B. Reactivity addition X was several times smaller in magnitude than reactivity addition Y.

C. Reactivity additions X and Y were about equal in magnitude.

D. There is not enough information given to determine the relationship between the reactivity additions.

QUESTION: 34

A nuclear power plant is undergoing a startup with the reactor coolant initially saturated at 508°F. The main steam isolation valves are closed and reactor criticality has been achieved. The reactor currently has a stable positive 100-second reactor period with reactor power well below the point of adding heat (POAH).

Which one of the following will occur first when reactor power reaches the POAH?

A. Reactor period will shorten.

B. Reactor pressure will increase.

C. Reactor coolant temperature will decrease.

D. Intermediate range power level will decrease.

QUESTION: 35

Ignoring the effects of changes in fission product poisons, which one of the following reactor power changes requires the greatest amount of positive reactivity addition?

A. 3 percent to 10 percent

B. 10 percent to 25 percent

C. 25 percent to 65 percent

D. 65 percent to 100 percent

QUESTION: 36

A nuclear power plant has been operating at 100 percent power for several weeks when a reactor scram occurs. How much time will be required for core decay heat production to decrease to one percent power following the scram?

A. 1 to 8 seconds

B. 1 to 8 minutes

C. 1 to 8 hours

D. 1 to 8 days

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 with equal water levels and 20 psia gas pressure above the water. The tanks are surrounded by standard atmospheric pressure. The temperature of the water in the tanks and reference legs is 70°F.

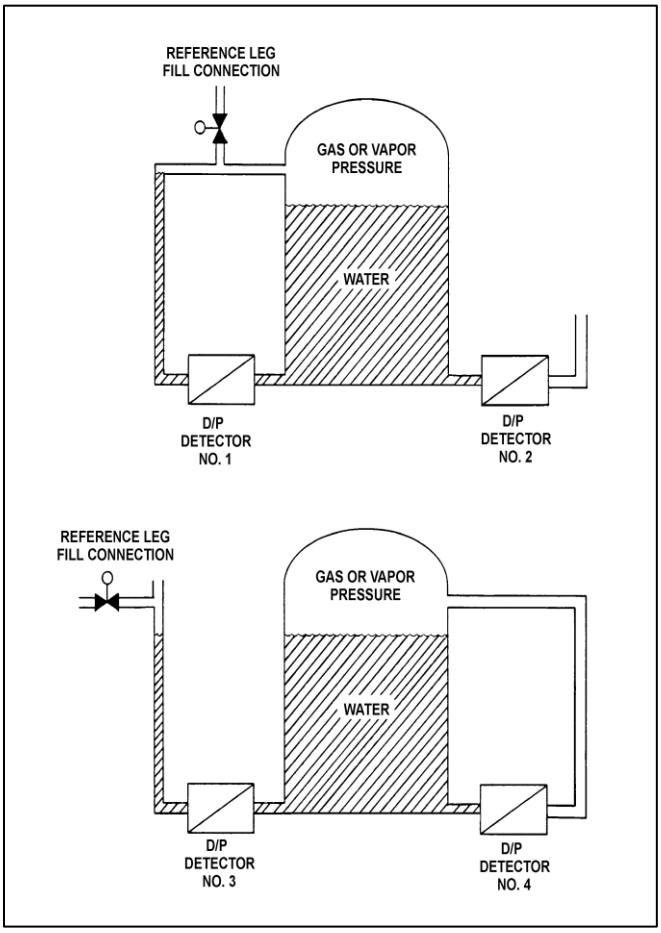
If each detector experiences a ruptured diaphragm, which detector(s) will produce a higher level indication? (Assume that actual tank and reference leg water levels do not change.)

A. No. 1 only

B. No. 2 only

C. No. 1 and 3

D. No. 2 and 4



QUESTION: 38

An open container holds 1.0 lbm of saturated water at standard atmospheric pressure. The addition of 1.0 Btu will…

A. raise the temperature of the water by 1°F.

B. vaporize a portion of the water.

C. increase the density of the water.

D. result in 1°F of superheat.

QUESTION: 39

Which one of the following explains why condensation of the steam entering a main condenser creates a vacuum?

A. The entropy of the steam increases.

B. The entropy of the steam decreases.

C. The specific volume of the steam increases.

D. The specific volume of the steam decreases.

QUESTION: 40

A main turbine consists of a high pressure (HP) unit and several low pressure (LP) units. The main turbine is most likely to experience stress-related failures of the rotor blades in the _____ stages of the _____ unit(s).

A. inlet; HP

B. inlet; LP

C. outlet; HP

D. outlet; LP

QUESTION: 41

Refer to the drawing of centrifugal pump and system operating curves (see figure below).

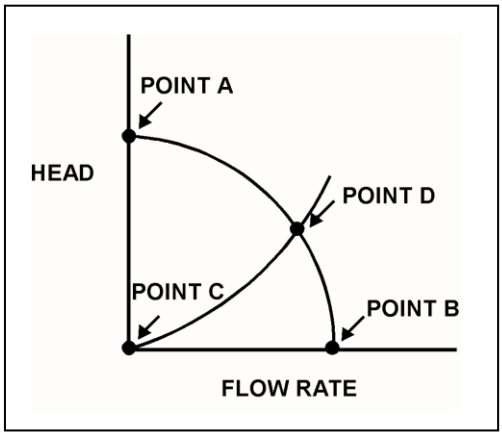
Which one of the following determines the general shape of the curve from point C to point D?

A. The frictional and throttling losses in the piping system as the system flow rate increases.

B. The frictional losses between the pump impeller and its casing as the differential pressure (D/P) across the pump increases.

C. The pump flow losses, due to the decrease in available net positive suction head as the system flow rate increases.

D. The pump flow losses, due to back leakage through the clearances between the pump impeller and casing as the D/P across the pump increases.



QUESTION: 42

Refer to the drawing of two lengths of 6-inch diameter pipe, each containing an identical automatic isolation valve. The actual pipe lengths are proportional to their symbols in the drawing

Water at 65°F is flowing at 1,000 gpm through each pipe. If the isolation valves instantly close, valve A piping will experience a pressure increase that is _____ the pressure increase experienced by valve B piping; and the pressure spike will dissipate quicker in the _____ length of pipe.

A. equal to; shorter

B. equal to; longer

C. less than; shorter

D. less than; longer

QUESTION: 43

A nuclear power plant is operating with the following stable reactor vessel (RV) and feedwater (FW) parameters:

RV pressure = 1,000 psia
RV steam flow rate = 1.0×10^7 lbm/hr (dry, saturated steam)
FW inlet temperature = 470°F

Based on the above information, what is the thermal power output of the reactor?

A. 740 MW

B. 1,328 MW

C. 2,169 MW

D. 3,497 MW

QUESTION: 44

The magnitude of the local fuel pin heat flux that is necessary to cause the onset of transition boiling is...

A. greatest at the top of the core and smallest at the bottom of the core.

B. greatest at the bottom of the core and smallest at the top of the core.

C. greatest at the core midplane and smallest at the top and bottom of the core.

D. greatest at the top and bottom of the core and smallest at the core midplane.

QUESTION: 45

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.

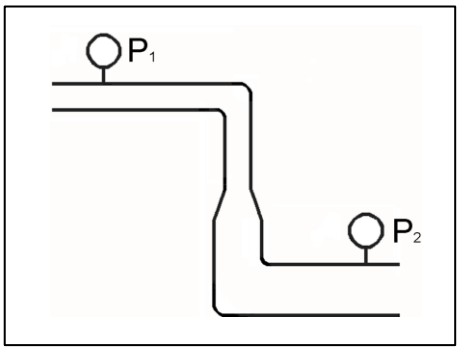
The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

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: 46

Given:

- Reactors A and B are identical except that reactor A has no core orifices while reactor B is equipped with orifices.
- Both reactors always operate with identical recirculation system flow rates.
- Both reactors are operating at steady-state 80 percent power.
- Both reactors have the same core power distribution.

Compared to reactor A, the critical power ratio (CPR) in the central fuel bundles of reactor B is _____; and the average power in the peripheral fuel bundles of reactor B is _____.

A. smaller; smaller

B. smaller; larger

C. larger; smaller

D. larger; larger

QUESTION: 47

Maintaining the linear heat generation rate below the thermal limit ensures that...

A. peak cladding temperature after a design basis loss of coolant accident will not exceed 2,200°F.

B. during transients, more than 99.97 percent of the fuel rods will avoid transition boiling.

C. plastic strain of the cladding will not exceed 1 percent.

D. peaking factors will not exceed those assumed in the safety analysis.

QUESTION: 48

A nuclear power plant is operating at 90 percent power near the end of a fuel cycle when a signal error causes the turbine control system to throttle the turbine control valves 5 percent in the closed direction. Assuming the turbine control valves stabilize in their new position and 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: 49

Which one of the following operations is most likely to cause significant pellet-cladding interaction?

A. Increasing reactor power from 20 percent to 50 percent near the beginning of a fuel cycle.

B. Increasing reactor power from 20 percent to 50 percent near the end of a fuel cycle.

C. Increasing reactor power from 70 percent to 100 percent near the beginning of a fuel cycle.

D. Increasing reactor power from 70 percent to 100 percent near the end of a fuel cycle.

QUESTION: 50

Which one of the following comparisons yields a lower probability for brittle fracture of a reactor vessel?

A. A high gamma flux in the reactor rather than a high fast neutron flux.

B. A high material strength of the reactor vessel rather than a high material ductility.

C. A rapid 100°F reactor heatup at a low temperature rather than at a high temperature.

D. A rapid 100°F reactor cooldown at a low temperature rather than at a high temperature.

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

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

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