UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
MARCH 2013--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)

$DRW \propto \varphi^2_{tip} / \varphi^2_{avg}$

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

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

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

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

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

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

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

Thermal Efficiency = Net Work Out/Energy In

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

$g_c = 32.2$ 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

Given the following pressure specifications for a safety relief valve (SRV):

Setpoint pressure (SRV will start to open) = 1,200 psia
Maximum pressure (SRV will be fully open) = 1,242 psia
Reseat pressure (SRV will be fully closed) = 1,152 psia

Which one of the following is the percent accumulation for the SRV?

A. 2.5 percent

B. 3.0 percent

C. 3.5 percent

D. 4.0 percent

QUESTION: 2

An adjustment has just been completed on the packing gland of an automatic valve to stop a minor stem leak. Which one of the following can occur if the technician overtightened the packing gland?

A. Decreased cooling flow to the valve internals.

B. Separation of the valve disk from the valve stem.

C. Misalignment of the valve position limit switches.

D. Increased stroke time from fully open to fully closed.

QUESTION: 3

Which one of the following types of similarly sized valves requires the most manual valve stem rotation to move the valve from fully open to fully closed? (Assume that each valve has a non-rising stem.)

A. Ball

B. Gate

C. Plug

D. Butterfly

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 a local steam leak raises the temperature of the bourdon tube by 50ºF? (Assume the cooling water system pressure does not change.)

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

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

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

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

QUESTION: 5

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

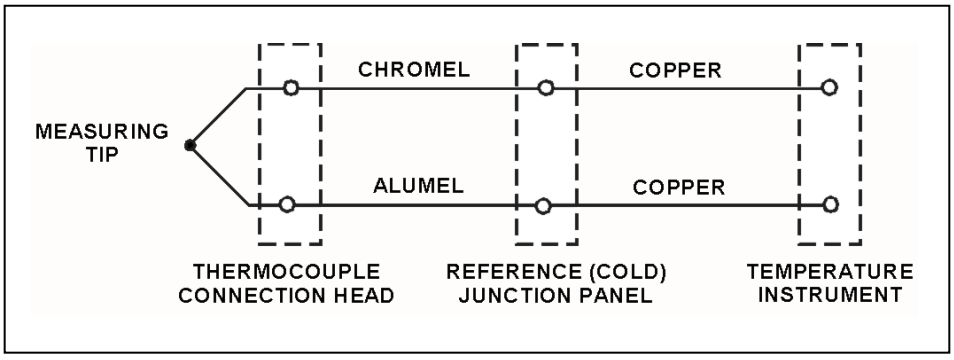
What is the effect on the thermocouple reference junctions if the chromel and alumel extension wires from the thermocouple connection head to the reference junction panel are replaced with copper wires?

A. There will no longer be any reference junctions.

B. The reference junctions will be located in the temperature instrument.

C. The reference junctions will still be located in the reference junction panel.

D. The reference junctions will be located in the thermocouple connection head.



QUESTION: 6

A loss-of-coolant accident resulted in a reactor scram. The source range monitors (SRMs) were fully inserted and are currently located in a voided section of the core.

If the SRMs are subsequently positioned below the core water level, the SRM count rate will…

A. decrease due to decreased neutron migration length.

B. decrease due to decreased thermal neutron flux.

C. increase due to increased neutron migration length.

D. increase due to increased thermal neutron flux.

QUESTION: 7

A Geiger-Mueller detector with a "pancake" probe (often called a frisker) is being used to monitor personnel leaving a radiologically controlled area. The probe is equipped with a mica window.

Two individuals have radioactive skin contamination—one individual with only alpha emitters, and the other with only beta emitters. Both types of radiation are being emitted at the same rate. The same percentage of each type of radiation enters the probe's detection chamber and causes ionization.

Which one of the following describes the detector's count rate response to the alpha and beta radiation?

A. The count rate will be higher for the alpha radiation.

B. The count rate will be higher for the beta radiation.

C. The count rate will be the same for both types of radiation.

D. Cannot be determined without knowing the energy levels of the radiation.

QUESTION: 8

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 level setpoint.

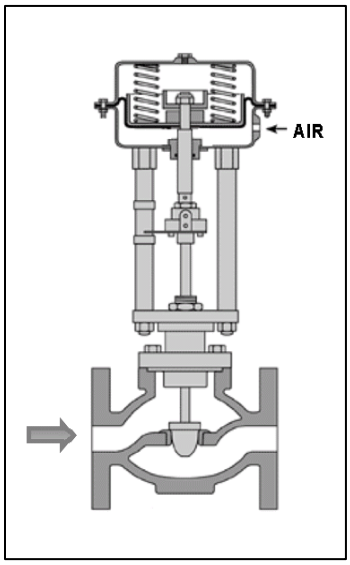
Which one of the following describes the characteristics of the tank level controller?

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

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

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

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

QUESTION: 10

Operating a motor-driven centrifugal pump under "pump runout" conditions can cause...

A. excessive pump head, cavitation, and motor overload.

B. motor overload, cavitation, and increased pump vibration.

C. increased pump vibration, excessive pump head, and cavitation.

D. no damage, because all pumps and motors are designed to operate without failure under pump runout conditions.

QUESTION: 11

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction on a water reservoir. The reservoir water level and the eye of the pump impeller are both at sea level.

Given:

- The pump has a design shutoff head of 100 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The reservoir water temperature is 60°F.
- A fire hose connected to the fire main is being used to suppress an elevated fire.

At which one of the following fire hose spray nozzle elevations (referenced to sea level) will the pump first be unable to provide flow? (Disregard head loss in the fire main and fire hose.)

A. 86 feet

B. 101 feet

C. 116 feet

D. 135 feet

QUESTION: 12

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

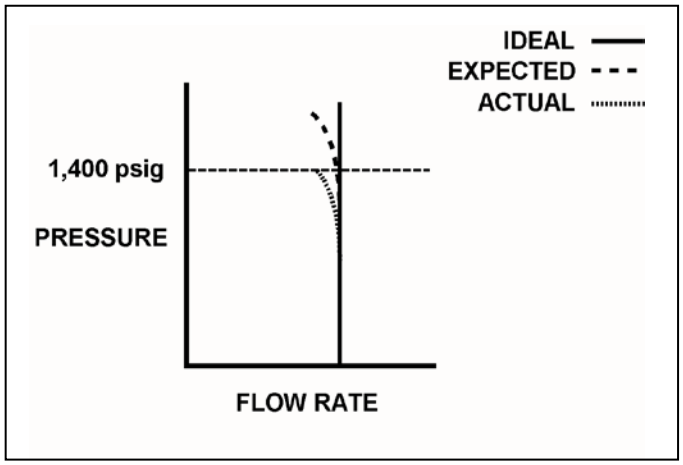
Which one of the following could cause the observed difference between the expected and the actual pump performance?

A. Pump internal leakage is greater than expected.

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

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

D. Available NPSH decreased more than expected, but remains slightly above required NPSH.



QUESTION: 13

Prior to starting a positive displacement pump, the discharge valve should be open to...

A. prevent rupturing the pump casing.

B. limit the pump motor starting time.

C. ensure the pump casing fills by backflow.

D. reduce pressure fluctuations in the discharge piping.

QUESTION: 14

Two identical AC induction motors are connected to identical radial-flow centrifugal pumps in identical but separate cooling water systems. Each motor is rated at 200 hp. The discharge valve for pump A is fully open and the discharge valve for pump B is fully closed. Each pump is currently off.

If the pumps are started under these conditions, the shorter time period required to reach a stable running current will be experienced by the motor for pump _____; and the higher stable running current will be experienced by the motor for pump _____.

A. A; A

B. A; B

C. B; A

D. B; B

QUESTION: 15

A main generator that is connected to an infinite power grid has the following indications:

600 MW
100 MVAR (in)
13,800 amps
25 KV

If main generator excitation current is increased slightly, amps will initially _____; and MW will initially _____.

A. increase; increase

B. decrease; increase

C. increase; remain the same

D. decrease; remain the same

QUESTION: 16

The rate of heat transfer between two liquids in a heat exchanger will increase if the… (Assume specific heats do not 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

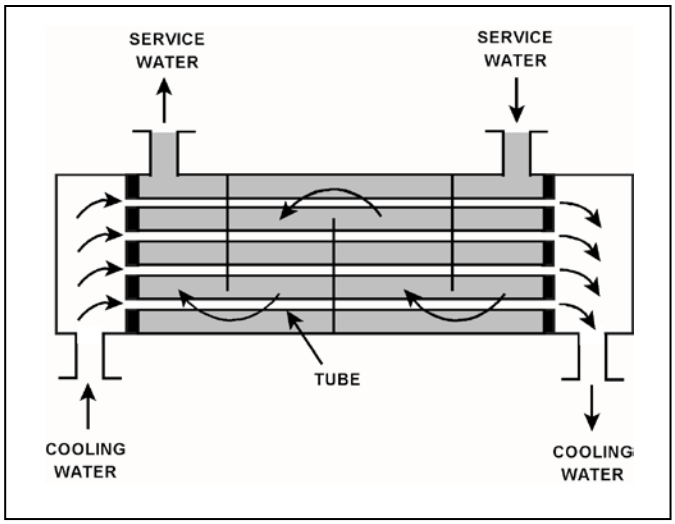
Refer to the drawing of a heat exchanger (see figure below).

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

Cooling water inlet temperature = 70°F
Service water inlet temperature = 130°F

Assume that both fluids have the same specific heat, and that cooling water mass flow rate is greater than service water mass flow rate. Which one of the following pairs of heat exchanger outlet temperatures is not possible?

	Cooling Water Outlet Temp.	Service Water Outlet Temp.
A.	78°F	120°F
B.	90°F	110°F
C.	98°F	100°F
D.	100°F	90°F



QUESTION: 18

A nuclear power plant is operating at steady-state 100 percent power when air inleakage causes main condenser vacuum to decrease from 28 inches Hg vacuum to 27 inches Hg vacuum. Assume the main steam inlet pressure, quality, and mass flow rate through the main turbine do not change, and the condenser cooling water inlet temperature and mass flow rate do not change.

When the plant stabilizes, turbine exhaust quality will be _____; and turbine exhaust temperature will be _____.

A. lower; lower

B. lower; higher

C. higher; lower

D. higher; higher

QUESTION: 19

Which one of the following describes the process of backwashing a mixed-resin deep bed demineralizer?

A. Alternating the flow of dilute acidic and caustic solutions through the demineralizer to remove suspended solids and colloidal matter.

B. Alternating the flow of dilute acidic and caustic solutions through the demineralizer to remove ionic impurities.

C. Reversing the flow of pure water through the demineralizer to remove suspended solids and colloidal matter.

D. Reversing the flow of pure water through the demineralizer to remove ionic impurities.

QUESTION: 20

Which one of the following is an indication of resin exhaustion in a demineralizer?

A. An increase in suspended solids in the effluent.

B. A decrease in the flow rate through the demineralizer.

C. An increase in the conductivity of the effluent.

D. An increase in the differential pressure across the demineralizer.

QUESTION: 21

A thermal overload device for a large motor protects the motor from...

A. sustained overcurrent by opening the motor breaker or motor line contacts.

B. sustained overcurrent by opening contacts in the motor windings.

C. instantaneous overcurrent by opening the motor breaker or motor line contacts.

D. instantaneous overcurrent by opening contacts in the motor windings.

QUESTION: 22

Refer to the drawing of a valve motor control circuit (see figure below) for a valve that is currently fully closed 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.

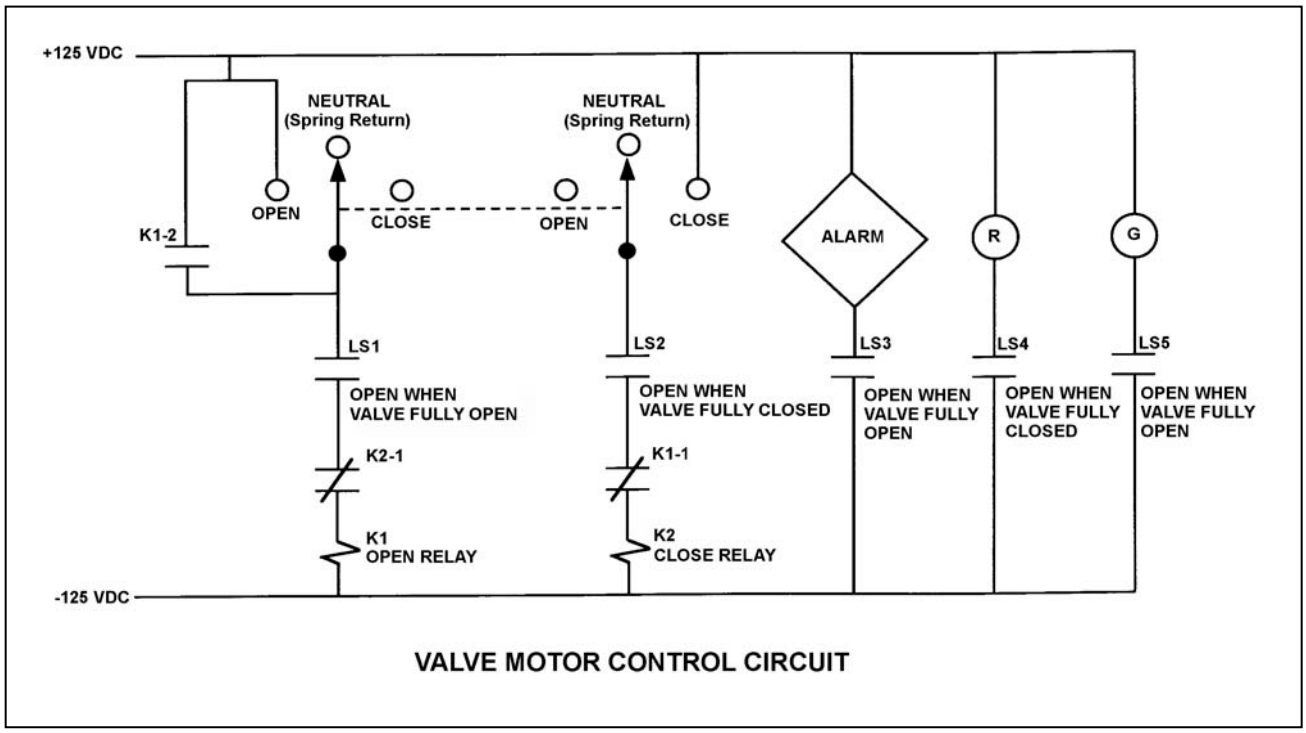
An operator takes the control switch to OPEN. Two seconds later, after verifying the valve is opening, the operator releases the control switch. Which one of the following describes the valve motor control circuit alarm response after the switch is released?

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

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

C. The alarm will actuate after approximately 8 seconds.

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



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 23

During a brief time interval in a typical reactor operating steady-state near the beginning of a fuel cycle, 4.25×10^{10} prompt neutrons were produced.

Approximately how many delayed neutrons were produced in the reactor during this same time interval?

A. 2.8×10^{8}

B. 6.5×10^{8}

C. 2.8×10^{9}

D. 6.5×10^{9}

QUESTION: 24

Which one of the following conditions describes a reactor that is exactly critical?

A. $K_{eff} = 0$; $\Delta K/K = 0$

B. $K_{eff} = 0$; $\Delta K/K = 1$

C. $K_{eff} = 1$; $\Delta K/K = 0$

D. $K_{eff} = 1$; $\Delta K/K = 1$

QUESTION: 25

If reactor power increases at a constant rate from 50 kW to 370 kW in 2 minutes, what is the approximate doubling time?

A. 42 seconds

B. 60 seconds

C. 86 seconds

D. 120 seconds

QUESTION: 26

Factors that affect the probability of resonance absorption of a neutron by a nucleus include...

A. excitation energy of the neutron, kinetic energy of the nucleus, and kinetic energy of the neutron.

B. kinetic energy of the neutron, excitation energy of the nucleus, and excitation energy of the neutron.

C. excitation energy of the nucleus, excitation energy of the neutron, and kinetic energy of the nucleus.

D. kinetic energy of the nucleus, kinetic energy of the neutron, and excitation energy of the nucleus.

QUESTION: 27

A nuclear power plant is operating at steady-state 70 percent power. Which one of the following will result in a less negative fuel temperature coefficient? (Consider only the direct effect of the change in each listed parameter.)

A. Increase in void fraction.

B. Increase in fuel temperature.

C. Increase in moderator temperature.

D. Increase in Pu-240 inventory in the core.

QUESTION: 28

Which one of the following materials is used in the control rods primarily for thermal neutron absorption?

A. Boron

B. Carbon

C. Gadolinium

D. Stainless Steel

QUESTION: 29

A reactor is operating at 60 percent power with thermal neutron flux peaked in the bottom half of the core. Partial withdrawal of a deep control rod will primarily affect total (versus local) core power because _____ is relatively high in the area of withdrawal.

A. fuel enrichment

B. thermal neutron flux

C. void content

D. moderator temperature

QUESTION: 30

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: 31

A nuclear power plant had been shut down for two weeks near the middle of a fuel cycle when a reactor startup was commenced. Twelve hours later, reactor power is 100 percent, where it is being maintained. Which one of the following is the primary reason for periodically withdrawing control rods during the next 36 hours?

A. To offset the buildup of xenon-135.

B. To offset the depletion of the reactor fuel.

C. To maintain an adequate shutdown margin.

D. To maintain reactor heat flux below the critical heat flux.

QUESTION: 32

Which one of the following is <u>not</u> a function performed by burnable poisons in an operating reactor?

A. Provide neutron flux shaping.

B. Provide more uniform power density.

C. Offset the effects of control rod burnout.

D. Allow higher enrichment of new fuel assemblies.

QUESTION: 33

After taking critical data during a reactor startup, the operator establishes a positive 26-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 that $\bar{\beta}_{eff}$ = 0.00579.)

A. -0.16% ΔK/K

B. -0.19% ΔK/K

C. -0.23% ΔK/K

D. -0.29% ΔK/K

QUESTION: 34

A nuclear power plant is undergoing a startup with the reactor water 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 <u>first</u> when reactor power reaches the POAH?

A. Reactor power will decrease.

B. Reactor period will lengthen.

C. Reactor pressure will increase.

D. Reactor water temperature will increase.

QUESTION: 35

Which one of the following increases in void fraction would produce the greatest amount of negative reactivity?

A. From 5 percent to 10 percent near the end of a fuel cycle.

B. From 5 percent to 10 percent near the beginning of a fuel cycle.

C. From 40 percent to 45 percent near the end of a fuel cycle.

D. From 40 percent to 45 percent near the beginning of a fuel cycle.

QUESTION: 36

A nuclear power plant is operating at steady-state 85 percent power when a failure of the turbine control system positions the turbine control valves to admit 10 percent more steam flow to the main turbine. No operator actions are taken and no protective system actuations occur. The turbine control valves remain in the failed position.

In response to the above, reactor power will…

A. increase until power level matches the new steam demand.

B. increase continuously and exceed reactor protection set points.

C. decrease and stabilize at a lower power level above the point of adding heat.

D. decrease and stabilize at a critical power level below the point of adding heat.

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 the same constant water level with 17 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.

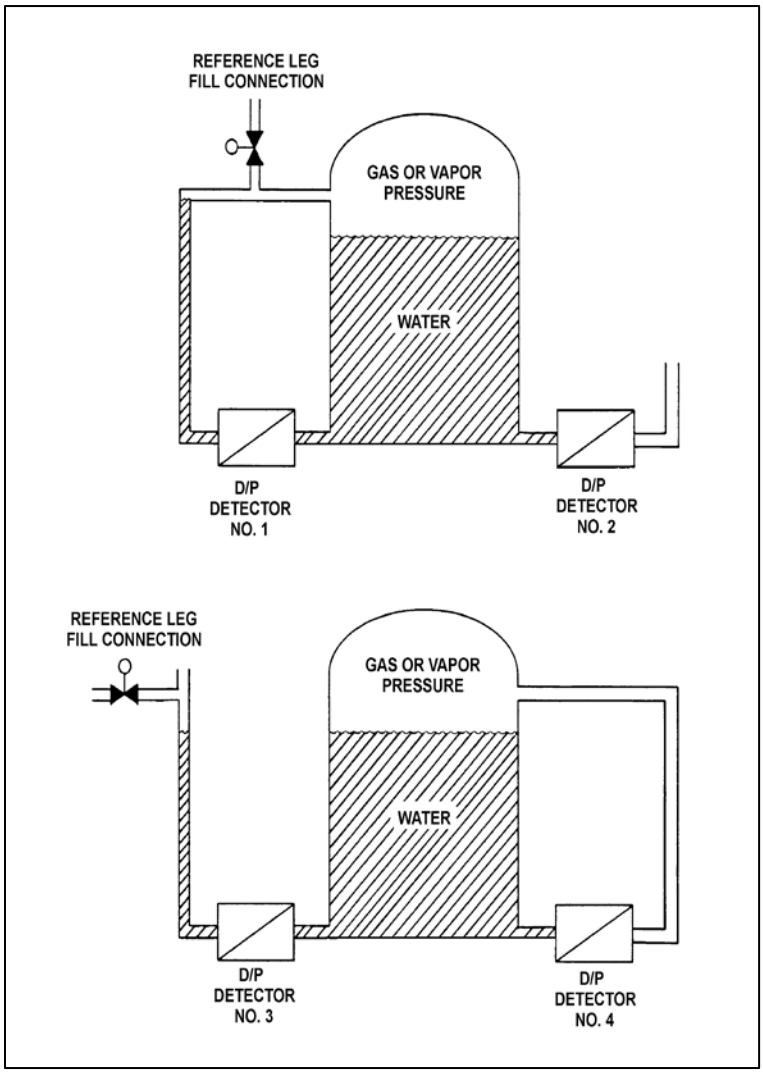
Which one of the level detectors is sensing the greatest D/P?

A. No. 1

B. No. 2

C. No. 3

D. No. 4



QUESTION: 38

Subcooled water is flowing through a heat exchanger with the following parameters:

Inlet temperature = 75ºF
Outlet temperature = 120ºF
Mass flow rate = 6.0×10^4 lbm/hr

What is the approximate heat transfer rate in the heat exchanger?

A. 1.1×10^6 Btu/hr

B. 2.1×10^6 Btu/hr

C. 2.7×10^6 Btu/hr

D. 3.3×10^6 Btu/hr

QUESTION: 39

A nuclear power plant is operating at 90 percent of rated power. Which one of the following effects will result from an increase in main condenser vacuum (lower absolute pressure)? (Assume reactor power and main steam mass flow rate are unchanged.)

A. An increase in condensate temperature.

B. An increase in main turbine efficiency.

C. An increase in condensate subcooling.

D. An increase in the heat transfer rate in the main condenser.

QUESTION: 40

If the moisture content of the steam supplied to a main turbine increases, turbine work will... (Assume the total mass flow rate does not change.)

A. increase, because moist steam is less likely to leak between turbine stages.

B. increase, because the enthalpy of the steam being supplied to the turbine has increased.

C. decrease, because moist steam is more likely to leak between turbine stages.

D. decrease, because the enthalpy of the steam being supplied to the turbine has decreased.

QUESTION: 41

Refer to the drawing of a cooling water system and the associated pump/system operating curves showing two-pump operation (see figure below).

Pumps A and B are identical single-speed centrifugal pumps and both pumps are operating.

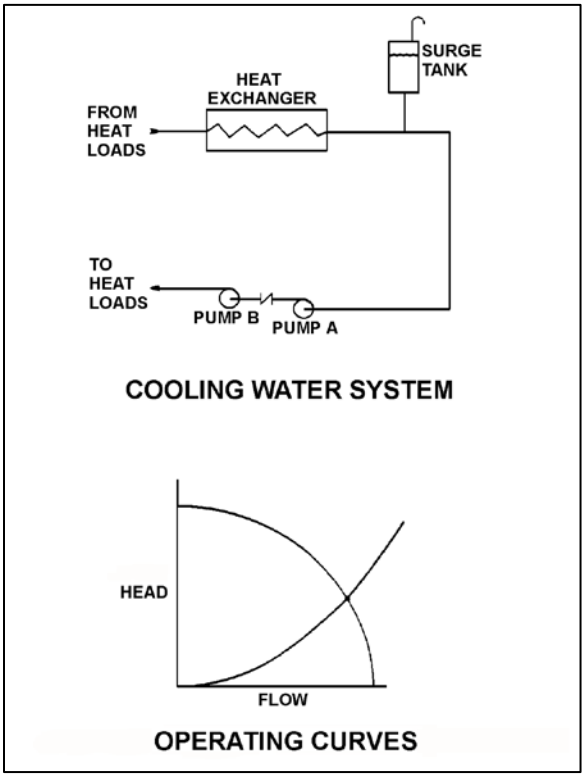
If pump B trips, the system flow rate will _____; and the total pump discharge pressure will _____.

A. remain the same; decrease

B. decrease; remain the same

C. remain the same; remain the same

D. decrease; decrease



QUESTION: 42

Which one of the following will increase the head loss occurring in an operating cooling water system?

A. Shifting two heat exchangers from parallel to series operation.

B. Increasing the flow rate in the system by throttling open a flow control valve.

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

D. Replacing a 20 foot section of 10-inch diameter pipe with a 20 foot section of 12-inch diameter pipe.

QUESTION: 43

The measure of heat input per unit time from the nuclear fuel to the reactor coolant in units of megawatts defines...

A. specific heat.

B. power density.

C. core thermal power.

D. percent reactor power.

QUESTION: 44

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

A. Decreases continuously.

B. Decreases, then increases.

C. Increases continuously.

D. Increases, then decreases.

QUESTION: 45

Carryunder is most damaging to which one of the following components?

A. Main turbine

B. Recirculation pump

C. Moisture separator (turbine)

D. Moisture separator (reactor vessel)

QUESTION: 46

After operating at a high power level for several weeks, a reactor was shut down several days ago and cooled down to repair a steam line leak. Shutdown cooling water pumps are currently being used to maintain reactor temperature and pressure. The pumps will be stopped in 30 minutes to test repairs.

What action, if any, should be taken to enhance natural circulation cooling during the test, and why?

A. No action is necessary; the increase of density in the downcomer and the reduction of density in the core region will easily support natural circulation.

B. No action is necessary; as the density of the mixture in the core region increases, the liquid in the downcomer will flow into the core.

C. Raise reactor vessel pressure to allow vessel relief valves to lift to create a heat sink for decay heat while control rod drive flow maintains inventory.

D. Raise reactor vessel water level above the bottom of the steam separators to provide a liquid flow path from the inside to the outside of the core shroud.

QUESTION: 47

In a reactor operating at full power, the fuel bundle with the lowest power always has the smallest...

A. critical power ratio.

B. radial peaking factor.

C. axial peaking factor.

D. critical heat flux.

QUESTION: 48

If a reactor is operating above its maximum average planar linear heat generation rate (MAPLHGR) prior to a loss of coolant accident, fuel pellet centerline temperature may reach 4,200°F and fuel cladding temperature may reach 2,300°F during the accident.

Which one of the following describes the likely fuel cladding failure mechanism if the above temperatures are reached?

A. Excessive fuel pellet expansion.

B. Excessive plastic strain in the cladding.

C. Excessive embrittlement of the cladding.

D. Excessive cadmium and iodine attack on the cladding.

QUESTION: 49

Which one of the following is most likely to result in fuel cladding damage?

A. Operating at 110 percent of reactor vessel design pressure.

B. An inadvertent reactor scram from 100 percent power.

C. Operating with a fuel bundle power greater than the critical power.

D. Operating with saturated nucleate boiling occurring in a fuel bundle.

QUESTION: 50

The nil-ductility transition temperature is the temperature above which...

A. a large compressive stress can result in brittle fracture.

B. a metal exhibits more ductile tendencies.

C. the probability of brittle fracture increases.

D. no appreciable deformation occurs prior to failure.

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

MARCH 2013 NRC GENERIC FUNDAMENTALS EXAMINATION
BOILING WATER REACTOR - ANSWER KEY

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