UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2015 – FORM A

Please Print

Name: _____

Docket No.: _____

Facility: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO APPLICANT

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

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

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

_____

Applicant's Signature

RULES AND INSTRUCTIONS FOR THE
NRC GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

NOTE: The term "control rod" refers to the length of neutron absorber material that can be positioned by the operator to change core reactivity.

NOTE: Numerical answers are rounded to the nearest whole number unless otherwise indicated.

1. Print your name in the blank provided on the cover sheet of the examination.

2. Fill in your individual docket number.

3. Fill in the name of your facility.

4. Fill in your start and stop times at the appropriate times.

5. Two aids are provided for your use during the examination:

   (1) An Equations and Conversions Sheet contained within the examination copy, and

   (2) Steam tables and Mollier Diagram provided by your proctor.

6. Place your answers on the answer sheet provided. Credit will only be given for answers properly marked on this sheet. Follow the instructions for filling out the answer sheet.

7. Scrap paper will be provided for calculations.

8. Cheating on the examination will result in the automatic forfeiture of this examination. Cheating could also result in severe penalties.

9. Restroom trips are limited. Only **one** examinee may leave the room at a time. In order to avoid the appearance or possibility of cheating, avoid all contact with anyone outside the examination room.

10. After you have completed the examination, sign the statement on the cover sheet indicating that the work is your own and you have neither given nor received any assistance in completing the examination. Either pencil or pen may be used.

11. Turn in your examination materials, answer sheet on top, followed by the examination copy and the examination aids, e.g., steam tables, handouts, and scrap paper.

12. After turning in your examination materials, leave the examination area as defined by the proctor. If after leaving you are found in the examination area while the examination is in progress, your examination may be forfeited.

GENERIC FUNDAMENTALS EXAMINATION
EQUATIONS AND CONVERSIONS SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

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

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

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

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

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

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

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

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

Thermal Efficiency = Net Work Out/Energy In

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

$g = 32.2\ \text{ft/sec}^2$

$g_c = 32.2$ lbm-ft/lbf-sec^2

CONVERSIONS

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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

A completely full water storage tank is being hydrostatically tested to 200 psig using a positive displacement pump (PDP) with a smooth and constant discharge flow rate of 8 gpm. The tank is protected by a relief valve and a safety valve that both discharge to the atmosphere. The valves have the following characteristics:

- The relief valve opening setpoint is 200 psig with an accumulation of 5 percent.
- The safety valve opening setpoint is 240 psig with a blowdown of 5 percent.
- Both valves have a maximum discharge flow rate of 6 gpm.

The PDP is inadvertently left running when tank pressure reaches 200 psig.

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

A. partially; 6 gpm

B. partially; 2 gpm

C. fully; 6 gpm

D. fully; 2 gpm

QUESTION: 2

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: 3

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 50°F? (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: 4

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

The measuring junction temperature is currently 300°F while the reference junction temperature is being held constant at 120°F. The thermocouple circuit is capable of indicating 32°F to 600°F and has just been calibrated at the current conditions.

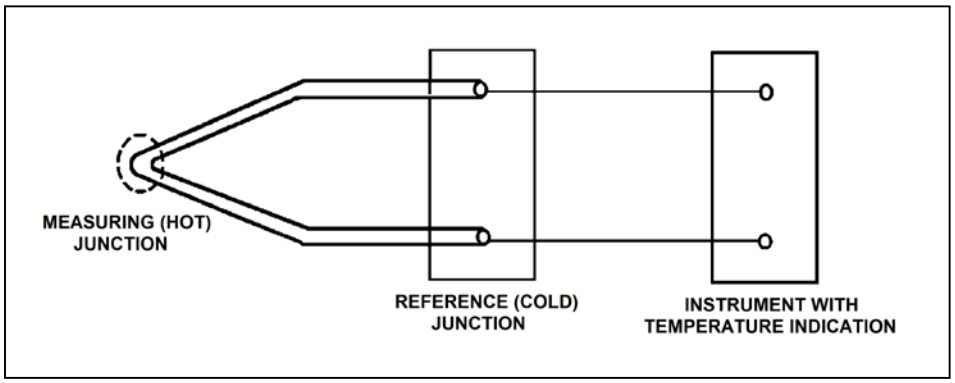
If the measuring junction temperature decreases and stabilizes at 90°F, what temperature will be indicated?

A. 32°F

B. 60°F

C. 90°F

D. 120°F



QUESTION: 5

What type of sensor is most commonly used to provide remote position indication of a valve that is normally either fully open or fully closed?

A. Limit switch

B. Reed switch

C. Servo transmitter

D. Linear variable differential transformer

QUESTION: 6

A nuclear plant worker normally wears a thermoluminescent dosimeter (TLD) or similar device for measuring whole body radiation exposure. When a self-reading pocket dosimeter (SRPD) is also required for whole body monitoring, where will the SRPD be worn and why?

A. Near the TLD to add exposure to the TLD measurement.

B. Near the TLD to measure radiation affecting the same part of the body.

C. Away from the TLD to add exposure to the TLD measurement.

D. Away from the TLD to measure radiation affecting a different part of the body.

QUESTION: 7

An automatic flow controller is being used to position a valve in a cooling water system. The controller develops a flow error signal and then increases the magnitude of the signal to drive the valve operator.

The factor by which the magnitude of the flow error signal is increased is referred to as...

A. gain.

B. bias.

C. feedback.

D. offset.

QUESTION: 8

Refer to the drawing of a pressure alarm circuit (see figure below). The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram.

The bistable turns on to actuate an alarm at a system pressure of 100 psig. The bistable has a 5 psig deadband, or neutral zone.

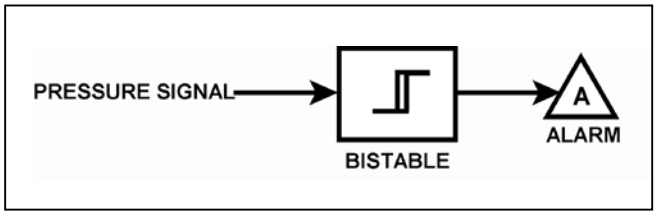
If system pressure increases to 105 psig, and subsequently decreases to _____; the status of the alarm will be _____.

A. 100 psig; off

B. 98 psig; off

C. 94 psig; on

D. 92 psig; off



QUESTION: 9

Given:

A reverse-acting proportional pneumatic controller will be used to maintain level in a water storage tank by positioning an air-operated flow control valve in the tank's drain line.
The controller's input will vary directly with tank level.

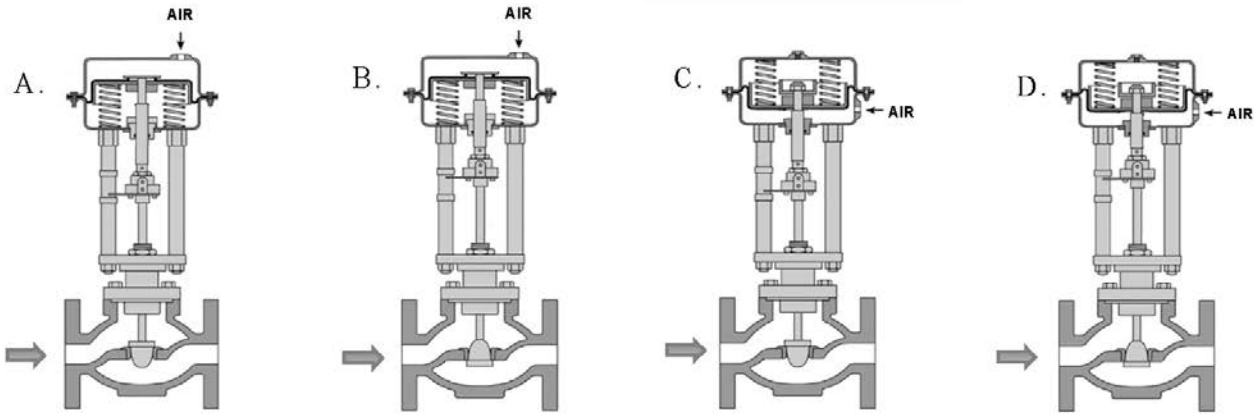
Which pair of flow control valves shown below will be compatible with the controller in the above application?

A. A and B

B. B and C

C. C and D

D. D and A



QUESTION: 10

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

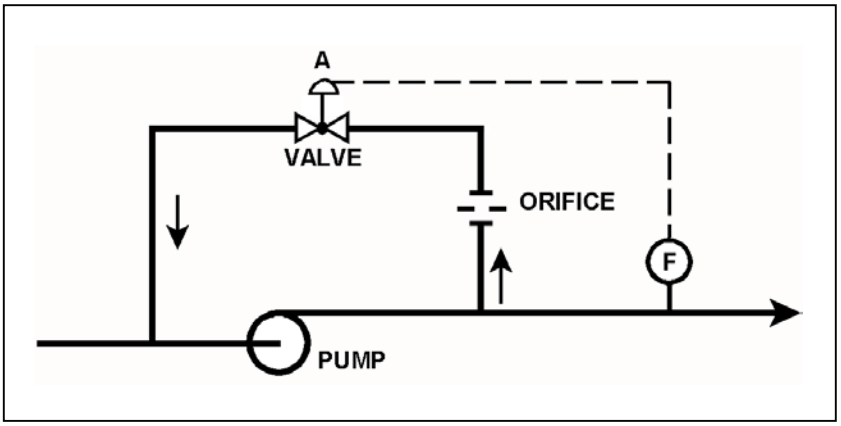
Which one of the following describes the response of the pump if a complete flow blockage occurs in the discharge line just downstream of the flow transmitter?

A. The pump will overheat after a relatively short period of time, due to a loss of both main flow and recirculation flow.

B. The pump will overheat after a relatively long period of time, due to a loss of main flow only.

C. The pump will overheat after a relatively long period of time, due to a loss of recirculation flow only.

D. The pump will be able to operate under these conditions indefinitely, due to sustained main flow.



QUESTION: 11

A radial-flow centrifugal cooling water pump is driven by an AC induction motor. The pump can supply cooling water to several heat loads, all of which are in parallel alignment. The following pump conditions initially exist:

Pump motor current = 100 amps
Pump flow rate = 400 gpm
Pump suction temperature = 70°F

Four hours later, the motor is drawing 95 amps. Which one of the following could be responsible for the observed decrease in motor amps?

A. The temperature of the cooling water being pumped decreased to 60°F with no change in pump flow rate.

B. The temperature of the cooling water being pumped increased to 80°F with no change in pump flow rate.

C. Cooling water flow was established to an additional heat load with no change in the temperature of the cooling water being pumped.

D. Cooling water flow was isolated from an out-of-service heat load with no change in the temperature of the cooling water being pumped.

QUESTION: 12

A motor-driven centrifugal pump is operating in an open system with its discharge valve throttled to 50 percent open. If the discharge valve is fully opened, available net positive suction head (NPSH) will _____; and required NPSH will _____.

A. remain the same; increase

B. remain the same; remain the same

C. decrease; increase

D. decrease; remain the same

QUESTION: 13

A centrifugal water pump is operating normally with the following parameters:

Inlet water pressure = 15 psia
Water temperature = 100°F
Pump head added = 100 feet

What is the pump discharge pressure?

A. 43 psia

B. 58 psia

C. 100 psia

D. 115 psia

QUESTION: 14

A 4,000 KW rated diesel generator (DG) is supplying 2,000 KW to a 4.16 KV emergency bus. The DG governor is in the isochronous mode (no speed droop). The emergency bus is about to be synchronized with, and then connected to, an infinite offsite power grid by closing the emergency bus normal power feeder breaker.

The following stable emergency bus and normal power conditions currently exist:

Emergency Bus (from DG)	Normal Power (from Offsite)
4.16 KV	4.16 KV
60.1 Hz	59.9 Hz

When the emergency bus normal power feeder breaker is closed, the DG will… (Assume no additional operator action is taken.)

A. transfer KW load to the offsite power grid, but remain partially loaded.

B. transfer KW load to the offsite power grid until the DG is completely unloaded.

C. acquire KW load from the offsite power grid, but remain within its KW load rating.

D. acquire KW load from the offsite power grid and ultimately exceed its KW load rating.

QUESTION: 15

The rate of heat production in the stator windings of an AC induction motor is _____ proportional to the _____ of the stator current.

A. directly, square

B. directly; amount

C. inversely; square

D. inversely; amount

QUESTION: 16

A nuclear power plant is shut down with core decay heat being removed by the residual heat removal (RHR) system. Assume that only the RHR heat exchangers are removing heat from the reactor coolant system (RCS) and that the RHR system provides complete thermal mixing of the RCS.

Given the following information:

Reactor core rated thermal power	=	2,950 MW
Core decay heat rate	=	0.6 percent rated thermal power
RHR system heat removal rate	=	8.1×10^7 Btu/hr
RCS c_p	=	1.05 Btu/lbm-°F
Combined RCS and RHR inventory	=	450,000 lbm

Which one of the following actions will establish an RCS cooldown rate between 20°F/hour and 30°F/hour?

A. Increase RHR heat exchanger flow rate to increase the cooldown rate by 10°F/hour.

B. Increase RHR heat exchanger flow rate to increase the cooldown rate by 20°F/hour.

C. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 10°F/hour.

D. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 20°F/hour.

QUESTION: 17

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

The heat exchanger was initially placed in continuous service 6 months ago. During the 6-month period of operation, mineral deposits have accumulated inside the heat exchanger tubes.

The following parameters are currently stable at their initial values:

- Lube oil mass flow rate
- Lube oil inlet temperature
- Lube oil outlet temperature
- Cooling water inlet temperature

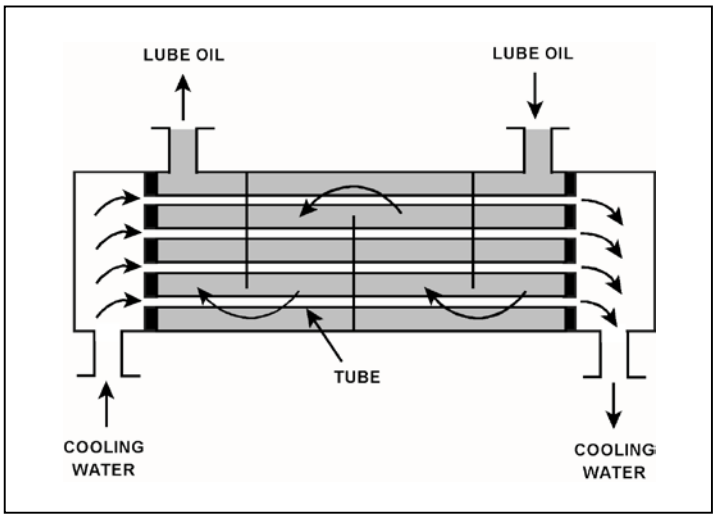
Compared to their initial values, the current cooling water outlet temperature is _____; and the current cooling water mass flow rate is _____.

A. higher; greater

B. higher; smaller

C. lower; greater

D. lower; smaller



QUESTION: 18

Which one of the following is an indication that a demineralizer resin has become exhausted?

A. Decreased demineralizer process water flow rate.

B. Decreased demineralizer influent conductivity.

C. Decreased demineralizer differential pressure.

D. Decreased demineralizer decontamination factor.

QUESTION: 19

Which one of the following, if processed through a demineralizer, will rapidly reduce the effectiveness of the demineralizer?

A. Oily water

B. Condensate

C. Makeup water

D. Radioactive water

QUESTION: 20

A main generator is being paralleled to the power grid. Generator voltage has been properly adjusted and the synchroscope is rotating slowly in the clockwise direction.

The generator breaker must be closed just as the synchroscope pointer reaches the 12 o'clock position to prevent...

A. motoring of the generator, due to unequal frequencies.

B. excessive MW load transfer to the generator, due to unequal frequencies.

C. excessive MW load transfer to the generator, due to out-of-phase voltages.

D. excessive arcing within the generator output breaker, due to out-of-phase voltages.

QUESTION: 21

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

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

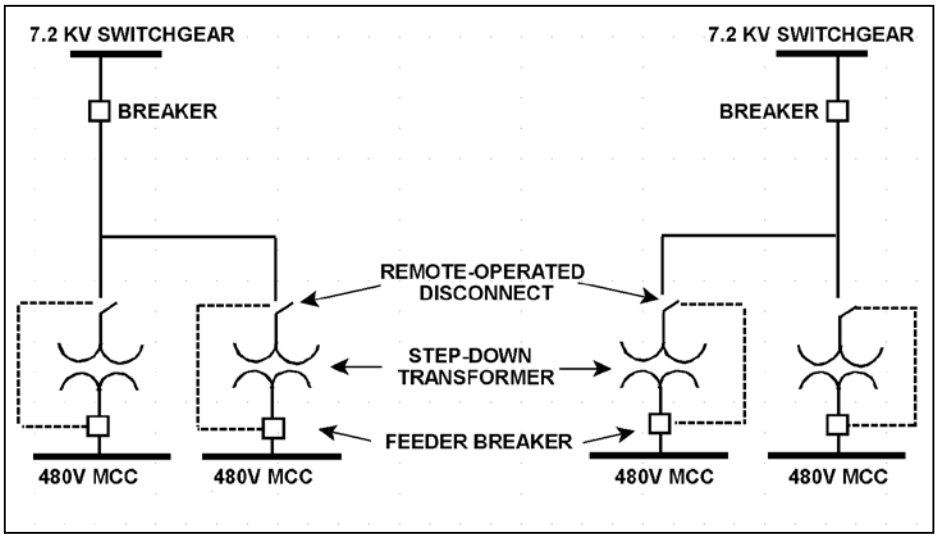
Which one of the following describes the purpose served by the interlock?

A. Prevent damage to the disconnect.

B. Prevent damage to the transformer.

C. Prevent damage to the feeder breaker.

D. Prevent damage to the 480V MCC.



QUESTION: 22

Breaker local overcurrent trip flag indicators, when actuated, indicate that...

A. a breaker trip will occur unless current is reduced.

B. a breaker overcurrent condition is responsible for a breaker trip.

C. an overcurrent condition has cleared and the breaker can be closed.

D. the associated breaker has failed to trip open during an overcurrent condition.

QUESTION: 23

Which one of the following types of neutrons in a reactor is more likely to cause fission of a U-238 nucleus in the reactor fuel? (Assume that each type of neutron remains in the reactor core until it interacts with a U-238 nucleus.)

A. Thermal neutron

B. Prompt fission neutron beginning to slow down

C. Delayed fission neutron beginning to slow down

D. Fission neutron at a U-238 resonance energy

QUESTION: 24

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

A. 0.988

B. 0.992

C. 0.996

D. Cannot be determined without additional information.

QUESTION: 25

A reactor core has a delayed neutron importance factor of 1.02. If the average delayed neutron fraction in the core is 0.0057, the effective delayed neutron fraction is...

A. equal to 0.0057.

B. less than 0.0057.

C. greater than 0.0057.

D. unpredictable without additional information.

QUESTION: 26

Which one of the following isotopes is the most significant contributor to the resonance capture of fission neutrons in a reactor at the end of a fuel cycle?

A. U-235

B. U-238

C. Pu-239

D. Pu-240

QUESTION: 27

With higher concentrations of boron in the reactor coolant, the core neutron flux distribution shifts to _____ energies where the absorption cross section of boron is _____.

A. higher; smaller

B. higher; greater

C. lower; smaller

D. lower; greater

QUESTION: 28

Reactor power was ramped from 80 percent power to 100 percent power over 4 hours. The 80 percent conditions were as follows:

Reactor coolant system (RCS) boron concentration	=	600 ppm
Control rod position	=	110 inches
RCS average temperature	=	575°F

The 100 percent conditions are as follows:

RCS boron concentration	=	580 ppm
Control rod position	=	130 inches
RCS average temperature	=	580°F

Given the following reactivity coefficient/worth values, and ignoring fission product poison reactivity changes, what was the average differential control rod worth during the power change?

Power coefficient	=	-0.03 %ΔK/K/percent
Moderator temperature coefficient	=	-0.02 %ΔK/K/°F
Differential boron worth	=	-0.01 %ΔK/K/ppm

A. -0.02 %ΔK/K/inch

B. -0.025 %ΔK/K/inch

C. -0.04 %ΔK/K/inch

D. -0.05 %ΔK/K/inch

QUESTION: 29

Which one of the following includes two reasons for control rod bank/group overlap?

A. Provide a more uniform axial power distribution and provide a more uniform differential rod worth.

B. Provide a more uniform differential rod worth and provide a more uniform radial power distribution.

C. Provide a more uniform radial power distribution and maintain individual and group rod position indicators within allowable tolerances.

D. Maintain individual and group rod position indicators within allowable tolerances and provide a more uniform axial power distribution.

QUESTION: 30

A reactor has been operating at 100 percent power for one month following a refueling outage with axial neutron flux distribution peaked in the bottom half of the core. An inadvertent reactor trip occurs. The reactor is restarted, with criticality occurring 6 hours after the trip. Reactor power is increased to 60 percent over the next 4 hours and then stabilized.

During the one-hour period immediately after power level is stabilized at 60 percent, the core axial neutron flux peak will be located _____ in the core than the pre-scram peak location; and the core axial neutron flux peak will be moving _____.

A. higher; upward

B. higher; downward

C. lower; upward

D. lower; downward

QUESTION: 31

Following a reactor trip, negative reactivity from xenon-135 initially increases due to...

A. xenon-135 production from the decay of iodine-135.

B. xenon-135 production from the spontaneous fission of uranium-235.

C. the reduction of xenon-135 removal by decay.

D. the reduction of xenon-135 removal by recombination.

QUESTION: 32

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

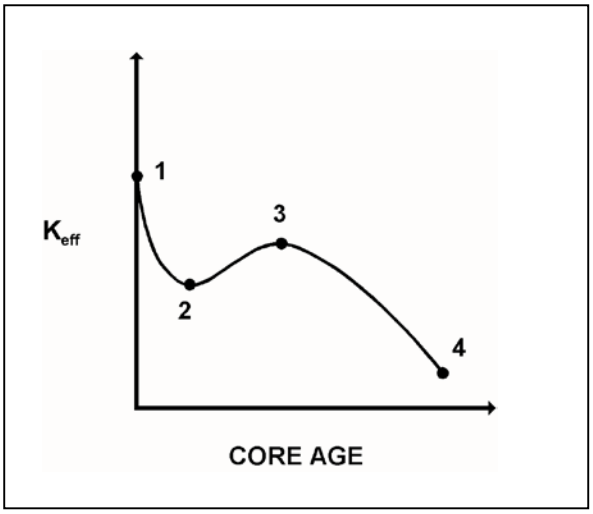
The major cause for the change in K_{eff} from point 1 to point 2 is the…

A. depletion of fuel.

B. burnout of burnable poisons.

C. initial heatup of the reactor.

D. buildup of fission product poisons.



QUESTION: 33

A reactor is shutdown with a K_{eff} of 0.96. The source range count rate is stable at 480 cps. What percentage of the core neutron population is being contributed directly by neutron sources other than neutron-induced fission?

A. 4 percent

B. 50 percent

C. 96 percent

D. 100 percent

QUESTION: 34

A reactor startup is in progress following a reactor trip from steady-state 100 percent power. Which one of the following conditions will result in criticality occurring at a rod position that is higher than the estimated critical rod position?

A. Misadjusting the steam dump (turbine bypass) controller such that steam generator pressure is maintained 50 psig higher than the required no-load setting.

B. Adjusting reactor coolant system boron concentration to 50 ppm lower than assumed for startup calculations.

C. A malfunction resulting in control rod speed being 10 percent slower than normal speed.

D. Delaying the time of startup from 10 days to 14 days following the trip.

QUESTION: 35

A nuclear power plant has been operating at 80 percent power for several weeks when a partial steam line break occurs that releases 2 percent of rated steam flow. Main turbine load and control rod position remain the same.

Assuming no operator or protective actions occur, when the plant stabilizes reactor power will be _____; and average reactor coolant temperature will be _____.

A. higher; higher

B. unchanged; higher

C. higher; lower

D. unchanged; lower

QUESTION: 36

A reactor is critical just below the point of adding heat when a single fully withdrawn control rod drops into the core. Assuming no operator or automatic actions occur, when the plant stabilizes reactor power will be _____; and average reactor coolant temperature will be _____.

A. the same; the same

B. the same; lower

C. lower; the same

D. lower; lower

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.

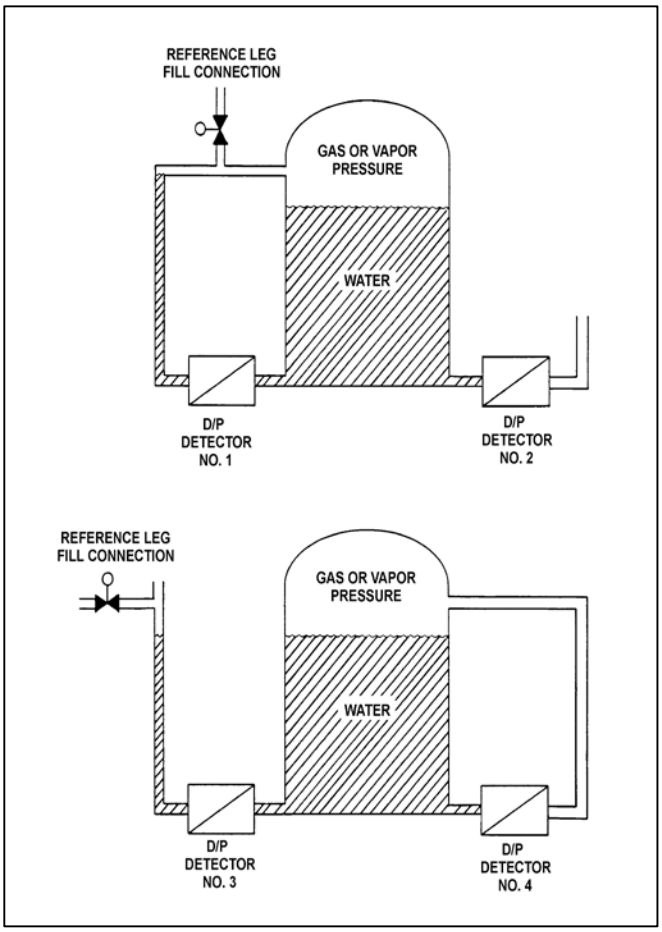
If each detector experiences a ruptured diaphragm, which detector(s) will produce a lower level indication? (Assume that actual tank and reference leg water levels do <u>not</u> change.)

A. No. 1 only

B. No. 2 only

C. No. 1, 2, and 3

D. No. 2, 3, and 4



QUESTION: 38

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

A. decrease; decrease

B. decrease; increase

C. remain the same; decrease

D. remain the same; increase

QUESTION: 39

Saturated steam at 900 psia enters a high pressure (HP) turbine and exhausts at 200 psia. The HP turbine exhaust passes through a 100 percent efficient moisture separator (with no heat gain or loss) before it enters a low pressure (LP) turbine. What is the enthalpy of the steam entering the LP turbine?

A. 1,028 Btu/lbm

B. 1,076 Btu/lbm

C. 1,107 Btu/lbm

D. 1,199 Btu/lbm

QUESTION: 40

Main turbine exhaust enters a main condenser and condenses at 126°F. The condensate is cooled to 100°F before entering the main condenser hotwell. Assuming main condenser vacuum does not change, which one of the following would improve the thermal efficiency of the steam cycle?

A. Increase condenser cooling water flow rate by 5 percent.

B. Decrease condenser cooling water flow rate by 5 percent.

C. Increase main condenser hotwell level by 5 percent.

D. Decrease main condenser hotwell level by 5 percent.

QUESTION: 41

A nuclear reactor has a thermal power rating of 3,200 MW. When the reactor operates at 100 percent power, the main generator produces 1,200 MW at a 0.95 power factor. Modifications are planned that will upgrade major power plant equipment without changing the reactor's thermal power rating. If the modifications improve the power plant's thermal efficiency by 3 percent, what will be the resulting main generator electrical output with the same power factor at 100 percent reactor power?

A. 1,224 MW

B. 1,236 MW

C. 1,264 MW

D. 1,296 MW

QUESTION: 42

Refer to the drawing of two lengths of 16-inch diameter pipe, each containing an identical automatic isolation valve. The actual pipe lengths are proportional to their symbols in the drawing.

Water is flowing at 10,000 gpm through each pipe when both isolation valves instantly close.

Consider two cases:

Case 1: The water temperature upstream of both valves is 65°F.
Case 2: The water temperature is 85°F upstream of valve A, and 65°F upstream of valve B.

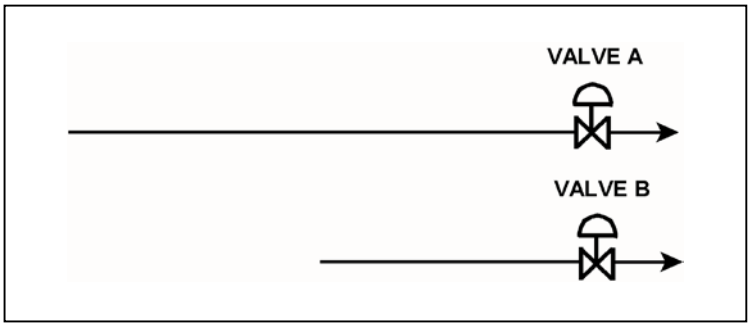
For which case(s), if any, will valve A experience a pressure spike that is greater than the pressure spike at valve B?

A. Case 1 only

B. Case 2 only

C. Both cases

D. Neither case



QUESTION: 43

Refer to the drawing of a venturi in a main steam line (see figure below). The venturi inlet and outlet pipe diameters are equal.

A main steam line break downstream of the venturi causes the main steam mass flow rate through the venturi to increase. Soon, the steam reaches sonic velocity in the throat of the venturi.

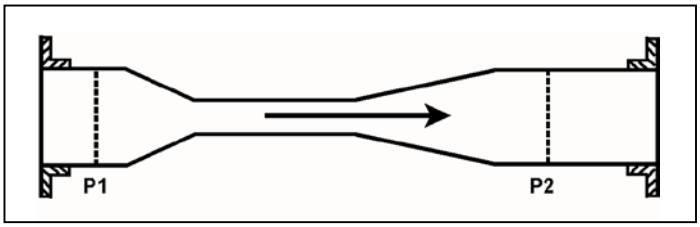
How will the main steam mass flow rate through the venturi be affected as the steam pressure downstream of the venturi continues to decrease?

A. It will continue to increase at a rate that is dependent on the steam velocity in the throat of the venturi.

B. It will continue to increase at a rate that is dependent on the differential pressure (P1 - P2) across the venturi.

C. It will <u>not</u> continue to increase because the steam velocity <u>cannot</u> increase above sonic velocity in the throat of the venturi.

D. It will <u>not</u> continue to increase because the differential pressure (P1 - P2) across the venturi <u>cannot</u> increase further once the steam reaches sonic velocity in the throat of the venturi.



QUESTION: 44

Two of the parameters listed below are used for calculating core thermal power using the standard heat balance method. Which one of the following identifies the two parameters?

	Reactor Coolant Mass Flow Rate	Feedwater Temperature	Steam Generator Pressure	Steam Generator Water Level
A.	Yes	No	Yes	No
B.	No	Yes	Yes	No
C.	Yes	No	No	Yes
D.	No	Yes	No	Yes

QUESTION: 45

A small increase in differential temperature at the fuel cladding-to-coolant interface causes increased steam blanketing and a reduction in heat flux. This describes which type of boiling?

A. Subcooled boiling

B. Nucleate boiling

C. Partial film boiling

D. Total film boiling

QUESTION: 46

Which one of the following is most likely to result in steam bubble formation in a reactor vessel head while maintaining a 40°F subcooling margin in the hottest RCS hot leg?

A. Performing a 25°F/hr RCS cooldown with natural circulation.

B. Performing a 25°F/hr RCS cooldown with forced circulation.

C. Performing a 50°F/hr RCS cooldown with natural circulation.

D. Performing a 50°F/hr RCS cooldown with forced circulation.

QUESTION: 47

A reactor is producing 3,400 MW of thermal output with a reactor vessel differential temperature (ΔT) of 60°F and a reactor vessel mass flow rate of 1.1×10^8 lbm/hr. If core ΔT is 63.6°F, what is core bypass mass flow rate? (Assume bypass flow ΔT equals 0°F.)

A. 5.66×10^6 lbm/hr

B. 6.23×10^6 lbm/hr

C. 5.66×10^7 lbm/hr

D. 6.23×10^7 lbm/hr

QUESTION: 48

A nuclear power plant is experiencing natural circulation core cooling following a loss of coolant accident. Which one of the following, when it first occurs, marks the beginning of reflux core cooling? (Assume the steam generators contain U-tubes.)

A. Reactor core steam production results in two-phase coolant entering the hot legs and being delivered to the steam generators.

B. Hot leg steam quality is so high that the steam generators cannot fully condense it, and two-phase coolant is returned to the reactor vessel via the cold legs.

C. Steam condensation in the hot legs is unable to pass completely through the steam generators to enter the cold legs.

D. The steam generators are no longer able to condense any of the steam contained in the hot legs.

QUESTION: 49

Which one of the following describes the fuel-to-coolant thermal conductivity for a fuel rod at the end of a fuel cycle (EOC) when compared to the beginning of the same fuel cycle (BOC)?

A. Smaller at EOC, due to fuel pellet densification.

B. Smaller at EOC, due to contamination of fill gas with fission product gases.

C. Larger at EOC, due to reduction in gap between the fuel pellets and cladding.

D. Larger at EOC, due to a greater temperature difference between the fuel pellets and coolant.

QUESTION: 50

Pressurized thermal shock is a condition that can occur following a rapid _____ of the reactor coolant system if system pressure is rapidly _____.

A. cooldown; decreased

B. cooldown; increased

C. heatup; decreased

D. heatup; increased

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

SEPTEMBER 2015 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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