UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2008--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% is required to pass this portion of the NRC operator licensing written examination. All examination papers will be collected 3.0 hours after the examination begins. This examination applies to a typical 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 GUIDELINES FOR THE NRC
GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

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

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 time.

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 of 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 - steam table booklets, handouts, and scrap paper used during the examination.

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 HANDOUT SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

$\ell^* = 1 \times 10^{-4}$ sec

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

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

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

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

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

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

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

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

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

$E = IR$

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 = 3.41×10^6 Btu/hr	1 Curie = 3.7×10^{10} dps
1 hp = 2.54×10^3 Btu/hr	1 kg = 2.21 lbm
1 Btu = 778 ft-lbf	1 gal_{water} = 8.35 lbm
°C = (5/9)(°F - 32)	1 ft^3_{water} = 7.48 gal
°F = (9/5)(°C) + 32	

QUESTION: 1

Which one of the following describes the function and use of the backseat on a manual valve?

A. Removes pressure from the packing/stuffing box and is typically used to isolate the stuffing box for valve repacking.

B. Removes pressure from the packing/stuffing box and is typically used when needed to isolate packing leakage.

C. Acts as a backup in case the primary seat leaks and is typically used during system isolation for personnel protection.

D. Acts as a backup in case the primary seat leaks and is typically used when needed to prevent the primary seat from leaking excessively.

QUESTION: 2

Which one of the following types of similarly sized valves requires the <u>most</u> 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: 3

The most probable cause for fluctuating indication from a liquid flow rate differential pressure detector is...

A. gas or steam being trapped in the liquid.

B. unequal temperature gradients in the liquid.

C. vortexing of the liquid passing through the flow device.

D. the valve on the high pressure sensing line being partially closed.

QUESTION: 4

The following is the current calibration data for an orifice plate that is being used for water flow rate measurement:

Upstream Pressure:	135 psig
Downstream Pressure:	120 psig
Flow Rate:	100 gpm

During a surveillance the following pressures are observed across the orifice plate:

Upstream Pressure:	124 psig
Downstream Pressure:	117 psig

What is the approximate water flow rate through the orifice plate?

A. 47 gpm

B. 57 gpm

C. 68 gpm

D. 78 gpm

QUESTION: 5

A nuclear power plant has experienced a loss of coolant accident with degraded emergency core cooling flow. Core voiding is homogeneous and the core void fraction is currently 20%.

Which one of the following describes excore source/startup range neutron level indication as homogeneous core voiding increases from 20% to 100% of the core? (Assume the neutron detectors are located adjacent to the bottom portion of the core.)

A. Decreases continuously.

B. Decreases, then increases.

C. Increases continuously.

D. Increases, then decreases.

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's operating voltage is increased but maintained within the true proportional operating 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

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: 8

The temperature of the water in a storage tank is monitored by a bistable alarm circuit. If water temperature decreases to 50°F a bistable turns on to actuate an alarm indicator. As soon as the water temperature exceeds 50°F the bistable turns off to clear the alarm.

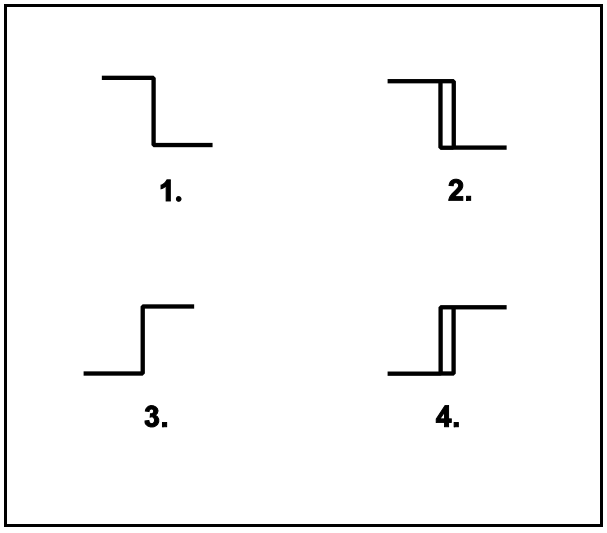
Which one of the following bistable symbols indicates the characteristics of the bistable used in the alarm circuit?

A. 1.

B. 2.

C. 3.

D 4.



QUESTION: 9

An air-operated isolation valve requires 2,400 lbf applied to the top of the actuator diaphragm to open against spring pressure. The actuator diaphragm has a diameter of 12 inches.

If control air pressure to the valve actuator begins to decrease from 100 psig, which one of the following is the approximate air pressure at which the valve will begin to close?

A. 5.3 psig

B. 16.7 psig

C. 21.2 psig

D. 66.7 psig

QUESTION: 10

A nuclear power plant is operating at full power when a 200 gpm reactor coolant leak occurs, which results in a reactor trip and initiation of emergency coolant injection. Reactor coolant system pressure stabilizes at 1,000 psia and all injection pumps are operating with their pump recirculation lines isolated. The shutoff heads for the pumps are as follows:

High pressure injection (HPI) pumps: 2,500 psia
Low pressure injection (LPI) pumps: 200 psia

Which pumps must be stopped quickly and why?

A. LPI pumps to prevent pump overheating caused by low flow.

B. HPI pumps to prevent pump overheating caused by low flow.

C. LPI pumps to prevent motor overheating caused by high flow.

D. HPI pumps to prevent motor overheating caused by high flow.

QUESTION: 11

A centrifugal pump is taking suction on a water storage tank and delivering the makeup water to a cooling water system. The pump will have the lowest net positive suction head requirement if the pump is operated at a relatively _____ speed with a _____ discharge flow control valve.

A. high; fully open

B. high; throttled

C. low; fully open

D. low; throttled

QUESTION: 12

Refer to the drawing of a cooling water system and the associated centrifugal pump operating curve (see figure below).

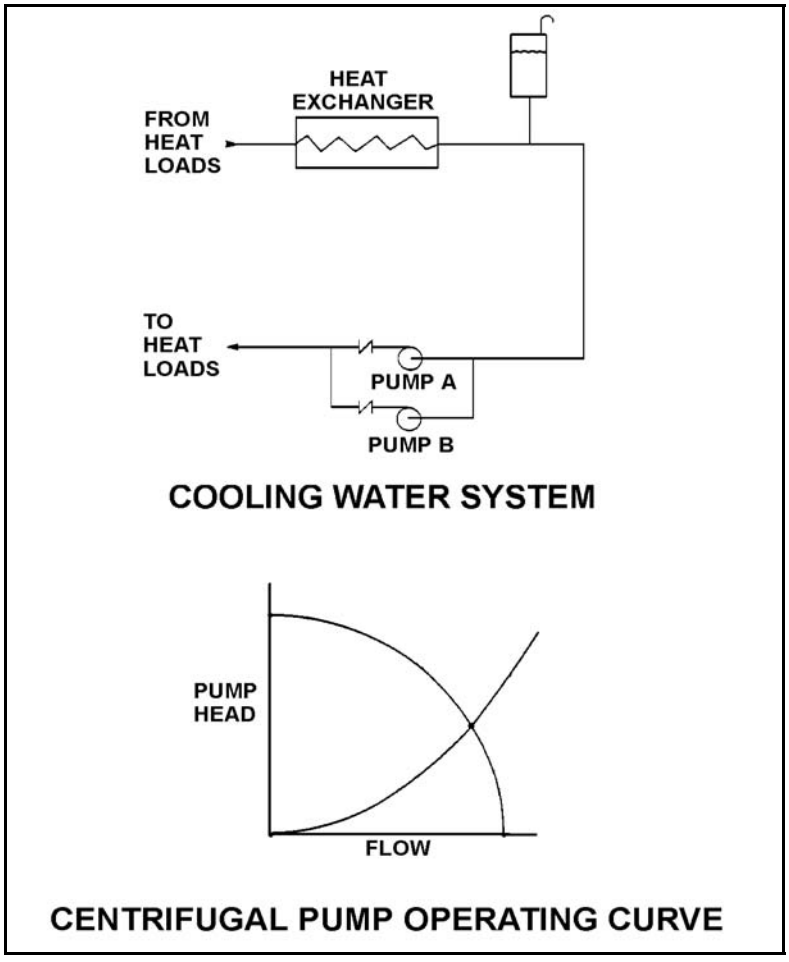
Pumps A and B are identical single-speed centrifugal pumps, and only pump A is operating. If pump B is started, after the system stabilizes system flow rate will be...

A. twice the original flow.

B. the same as the original flow.

C. less than twice the original flow.

D. more than twice the original flow.



QUESTION: 13

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

A. fully open; throttled

B. fully open; fully open

C. throttled; throttled

D. throttled; fully open

QUESTION: 14

A nuclear power plant is operating normally at 80% power when a reactor coolant pump (RCP) shaft seizes. Which one of the following indications would <u>not</u> accompany the seized shaft?

A. Reactor coolant system pressure transient.

B. Decreased flow rate in the associated reactor coolant loop.

C. Decreased flow rate in the remaining reactor coolant loop(s).

D. Increased current to the affected RCP with possible breaker trip.

QUESTION: 15

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: 16

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

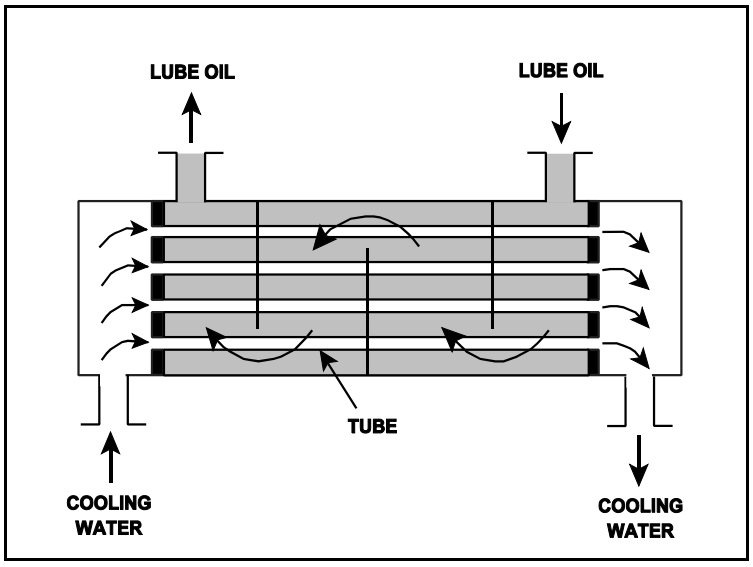
Assume that the inlet lube oil and inlet cooling water temperatures are constant and the lube oil flow rate remains the same. If the cooling water flow rate increases, the lube oil outlet temperature will _____ and the cooling water outlet temperature will _____.

A. increase, increase

B. increase, decrease

C. decrease, increase

D. decrease, decrease



QUESTION: 17

Severe stress in a mechanical component, induced by a sudden, unequally distributed temperature reduction is a description of...

A. fracture stress.

B. brittle fracture.

C. thermal shock.

D. pressurized thermal shock.

QUESTION: 18

The decontamination factor (or demineralization factor) of a condensate demineralizer has just been determined to be 10, based on conductivity measurements.

If condensate having a conductivity of 20 µmho/cm is flowing into this demineralizer, which one of the following is the conductivity of the condensate at the outlet of the demineralizer?

A. 0.5 µmho/cm

B. 2.0 µmho/cm

C. 5.0 µmho/cm

D. 10.0 µmho/cm

QUESTION: 19

After 12 months of operation at 100% power, a nuclear reactor is shutdown with a plant cooldown in progress. An operator reports that the general area radiation levels around the operating shutdown cooling pumps have increased significantly since the cooldown started several hours ago.

Which one of the following is a typical cause of these indications, resulting from the cooldown?

A. Increased radioactive tritium in the reactor coolant.

B. Increased radioactive oxygen-16 dissolved in the reactor coolant.

C. Increased radioactive nitrogen-16 dissolved in the reactor coolant.

D. Increased radioactive corrosion products suspended in the reactor coolant.

QUESTION: 20

A main generator is being connected to an infinite power grid. The following frequencies exist just prior to closing the generator output breaker:

Generator frequency:	59.9 Hz
Grid frequency:	60.1 Hz

When conditions stabilize just after the generator output breaker is closed, the generator frequency will be _____ and the grid frequency will be _____.

A. 59.9 Hz; 59.9 Hz

B. 59.9 Hz; 60.1 Hz

C. 60.0 Hz; 60.0 Hz

D. 60.1 Hz; 60.1 Hz

QUESTION: 21

While remotely investigating the condition of a normally-open 480 Vac motor control center (MCC) feeder breaker, an operator observes the following indications:

Green breaker position indicating light is out.
Red breaker position indicating light is lit.
MCC voltmeter indicates 480 Vac voltage.
MCC ammeter indicates zero amperes.

Based on these indications, the operator should report that the feeder breaker is _____ and racked _____.

A. open; in

B. closed; in

C. open; to the test position

D. closed; to the test position

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

In a comparison between a delayed neutron and a prompt neutron produced from the same fission event, the delayed neutron is more likely to... (Assume that each neutron remains in the core unless otherwise stated.)

A. cause fission of a U-238 nucleus.

B. require a greater number of collisions to become a thermal neutron.

C. be absorbed in a B-10 nucleus.

D. leak out of the core.

QUESTION: 24

Reactivity is defined as the fractional change in...

A. reactor power per second.

B. neutron population per second.

C. reactor period from criticality.

D. the effective multiplication factor from criticality.

QUESTION: 25

A PWR nuclear power plant has been shut down for two weeks and has the following stable initial conditions:

Reactor coolant temperature:	550°F
Reactor coolant boron concentration:	800 ppm
Source range count rate:	32 cps

A reactor coolant boron dilution is commenced. After two hours, with reactor coolant boron concentration stable at 775 ppm, the source range count rate is stable at 48 cps.

Assume the boron differential reactivity worth remains constant throughout the dilution. Also assume that reactor coolant temperature remains constant, control rod position does not change, and no reactor protection actuations occur.

If the reactor coolant boron concentration is reduced further to750 ppm, what will be the status of the reactor?

A. Subcritical, with a stable source range count rate of approximately 64 cps.

B. Subcritical, with a stable source range count rate of approximately 96 cps.

C. Critical, with a stable source range count rate of approximately 64 cps.

D. Critical, with a stable source range count rate of approximately 96 cps.

QUESTION: 26

Which one of the following conditions will cause the moderator temperature coefficient (MTC) to become more negative? (Consider only the direct effect of the indicated change on MTC.)

A. The controlling bank of control rods is inserted 5% into the core.

B. Fuel temperature decreases from 1500°F to 1200°F.

C. Reactor coolant boron concentration increases by 20 ppm.

D. Moderator temperature decreases from 500°F to 450°F.

QUESTION: 27

Given the following initial parameters:

Total power coefficient	= -0.020% ΔK/K/%
Boron worth	= -0.010% ΔK/K/ppm
Control rod worth	= -0.025% ΔK/K/inch inserted
Initial reactor coolant system (RCS) boron concentration	= 600 ppm

Which one of the following is the final RCS boron concentration required to support increasing plant power from 40% to 80% with 40 inches of outward control rod motion? (Ignore any change in fission product poison reactivity.)

A. 420 ppm

B. 580 ppm

C. 620 ppm

D. 780 ppm

QUESTION: 28

By maintaining the radial and axial core power distributions within their prescribed limits, the operator is assured that _____ will remain within acceptable limits.

A. power density (kW/foot) and departure from nucleate boiling ratio (DNBR)

B. DNBR and shutdown margin

C. core delta-T and power density (kW/foot)

D. shutdown margin and core delta-T

QUESTION: 29

Why are the control rod insertion limits power dependent?

A. Power defect increases as power increases.

B. Control rod worth decreases as power increases.

C. Doppler (fuel temperature) coefficient decreases as power increases.

D. Equilibrium core xenon-135 negative reactivity increases as power increases.

QUESTION: 30

Select the combination below that completes the following statement.

The amount of control rod withdrawal needed to overcome peak core xenon-135 negative reactivity will be <u>smallest</u> after a reactor trip from equilibrium _____ reactor power at the _____ of core life.

A. 20%; beginning

B. 20%; end

C. 100%; beginning

D. 100%; end

QUESTION: 31

A nuclear reactor was shut down for seven days to perform maintenance. A reactor startup was performed, and power level was increased from 1% to 50% over a two hour period.

Ten hours after reactor power reaches 50%, the magnitude of core xenon-135 negative reactivity will be...

A. increasing toward a downturn.

B. increasing toward an equilibrium value.

C. decreasing toward an equilibrium value.

D. decreasing toward an upturn.

QUESTION: 32

During a six-month period of continuous full power reactor operation, the reactor coolant boron concentration must be decreased steadily to compensate for...

A. buildup of fission product poisons and decreasing control rod worth.

B. fuel depletion and buildup of fission product poisons.

C. decreasing control rod worth and burnable poison burnout.

D. burnable poison burnout and fuel depletion.

QUESTION: 33

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

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

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

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

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

QUESTION: 34

Which one of the following is <u>not</u> required to determine the estimated critical boron concentration for a nuclear reactor startup to be performed 48 hours following an inadvertent reactor trip?

A. Reactor power level just prior to the trip

B. Steam generator levels just prior to the trip

C. Xenon reactivity in the core just prior to the trip

D. Samarium reactivity in the core just prior to the trip

QUESTION: 35

Refer to the drawing that shows a graph of startup rate versus time (see figure below). Both axes have linear scales.

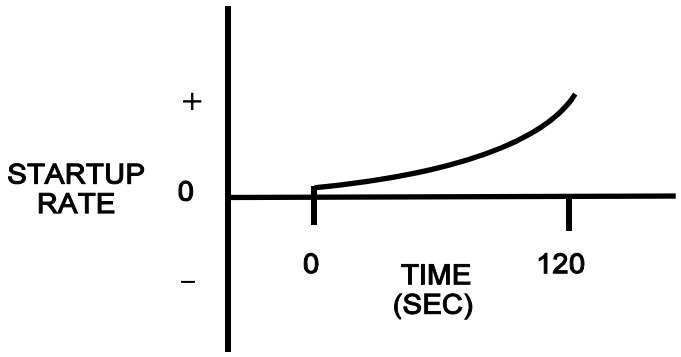
Which one of the following events, occurring at time = 0 seconds, would cause the reactor response shown on the graph?

A. A step addition of positive reactivity to a reactor that is initially stable in the power range and remains in the power range for the duration of the 120-second interval shown.

B. A constant rate of positive reactivity addition to a reactor that is initially stable in the power range and remains in the power range for the duration of the 120-second interval shown.

C. A step addition of positive reactivity to a reactor that is initially critical in the source range and remains below the point of adding heat for the duration of the 120-second interval shown.

D. A constant rate of positive reactivity addition to a reactor that is initially critical in the source range and remains below the point of adding heat for the duration of the 120-second interval shown.



QUESTION: 36

A nuclear power plant has been operating at rated power for six months when a reactor trip occurs. Which one of the following describes the source(s) of core heat generation 30 minutes after the reactor trip?

A. Fission product decay is the only significant source of core heat generation.

B. Delayed neutron-induced fission is the only significant source of core heat generation.

C. Fission product decay and delayed neutron-induced fission are both significant sources and produce approximately equal rates of core heat generation.

D. Fission product decay and delayed neutron-induced fission are both insignificant sources and generate core heat at rates that are less than the rate of ambient heat loss from the core.

QUESTION: 37

Refer to the drawing of four identical tank differential pressure level detectors (see figure below).

The tanks are identical and they are presently at 2 psig overpressure, 60°F, and the same constant water level. They are located within a sealed containment structure that is being maintained at atmospheric pressure. All level detectors have been calibrated and are producing the same level indication.

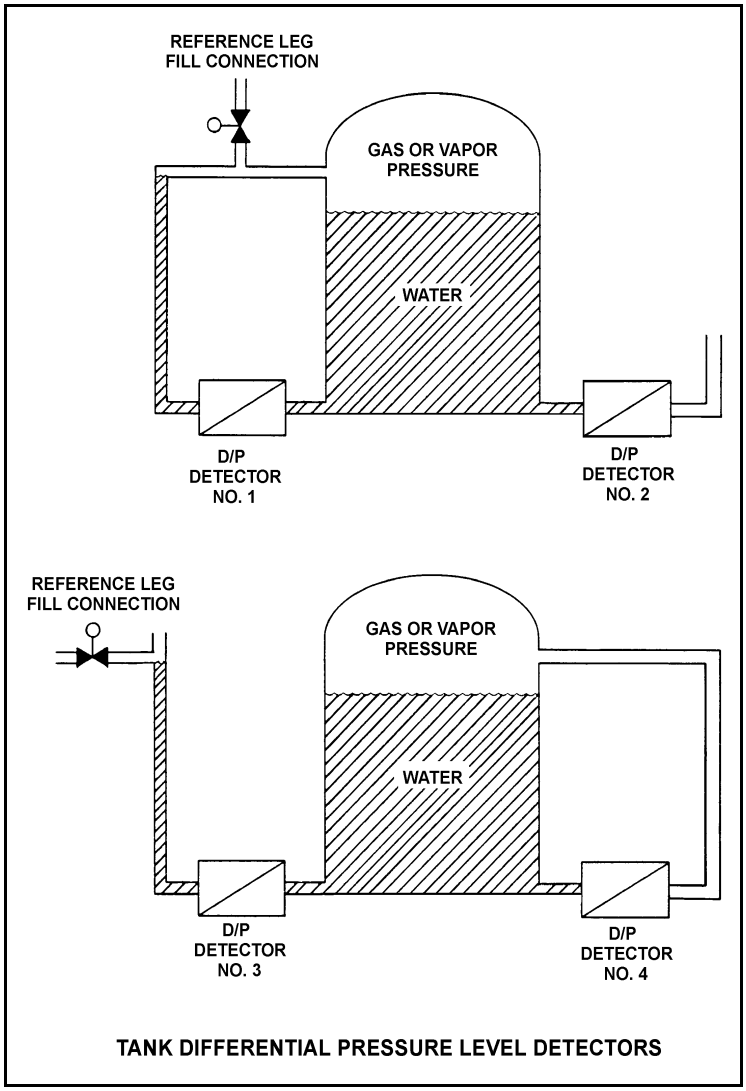
If a ventilation malfunction causes containment structure pressure to decrease to 12 psia, which level detectors will produce the lowest level indication?

A. 1 and 3

B. 2 and 4

C. 1 and 4

D. 2 and 3



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

QUESTION: 38

A nuclear reactor is operating normally at 100% power. Reactor coolant enters the reactor vessel at a temperature of 556°F and a total flow rate of 320,000 gpm. The reactor coolant leaves the reactor vessel at 612°F.

What is the approximate flow rate of the reactor coolant leaving the reactor vessel?

A. 320,000 to 329,000 gpm

B. 330,000 to 339,000 gpm

C. 340,000 to 349,000 gpm

D. 350,000 to 359,000 gpm

QUESTION: 39

An ideal steam turbine exhausts to a steam condenser at 1.0 psia. The turbine is driven by saturated steam at 600 psia. What is the work (Btu/hr) of the steam turbine if the turbine steam flow rate is 200,000 lbm/hr?

A. 7.9×10^6 Btu/hr

B. 1.6×10^7 Btu/hr

C. 7.9×10^7 Btu/hr

D. 1.6×10^8 Btu/hr

QUESTION: 40

A pressurizer safety valve is leaking by, allowing the 100% quality steam from the pressurizer to enter the discharge pipe, which remains at a constant pressure of 30 psig. Initial safety valve discharge pipe temperature is elevated but stable. Assume no heat loss from the safety valve discharge pipe.

Upon discovery of the leak, the reactor is shut down and a plant cooldown and depressurization are commenced. As pressurizer pressure slowly decreases from 2,000 psig to 1,800 psig, the safety valve discharge pipe temperature will...

A. decrease, because the entropy of the safety valve discharge will be decreasing.

B. decrease, because the enthalpy of the safety valve discharge will be decreasing.

C. increase, because the safety valve discharge will become more superheated as pressurizer pressure decreases.

D. remain the same, because the safety valve discharge will remain a saturated steam-water mixture at 30 psig.

QUESTION: 41

Which one of the following will cause overall nuclear power plant thermal efficiency to increase?

A. Increasing total steam generator blowdown from 30 gpm to 40 gpm.

B. Changing steam quality from 99.7% to 99.9%.

C. Bypassing a feedwater heater during normal plant operations.

D. Increasing condenser pressure from 1 psia to 2 psia.

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

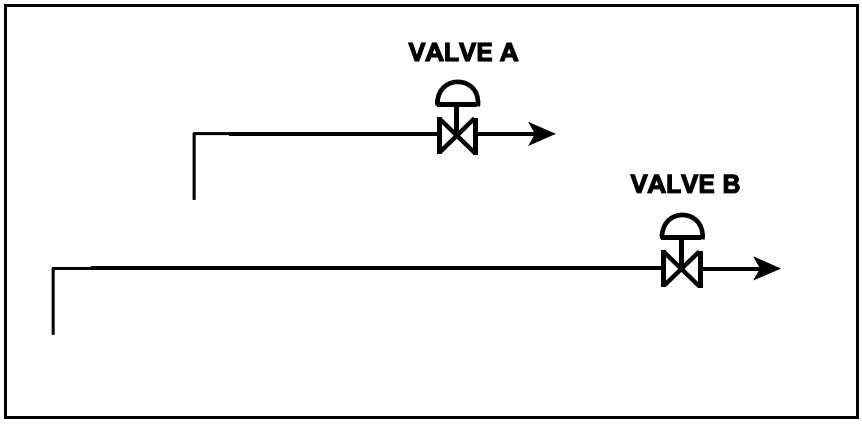
Water at 65°F is flowing at 1,000 gpm through each pipe. If the isolation valves suddenly and simultaneously close, valve A and its associated piping will experience a maximum pressure that is _____ the maximum pressure experienced by valve B and its associated piping. The pressure spike will dissipate 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 steam generator transient causes main steam pressure to increase although the actual mass flow rate of steam remains constant. If the main steam flow instrument is not density compensated, the increased main steam pressure will cause indicated steam mass flow rate to...

A. increase due to a higher steam velocity.

B. increase due to a greater steam density.

C. decrease due to a lower steam velocity.

D. decrease due to a reduced steam density.

QUESTION: 44

A nuclear power plant is operating at 60% power. Which one of the following is the primary method of heat transfer from the outer surface of the steam generator tubes to the bulk feedwater?

A. Radiolysis

B. Radiation

C. Convection

D. Conduction

QUESTION: 45

If the fission rate in a nuclear reactor core steadily increases, the mode of heat transfer that occurs immediately after the critical heat flux is reached is called...

A. transition boiling.

B. subcooled nucleate boiling.

C. saturated nucleate boiling.

D. stable film boiling.

QUESTION: 46

A nuclear reactor is producing 3,400 MW of thermal output with a vessel differential temperature (ΔT) of 60°F and a vessel mass flow rate of 1.1×10^8 lbm/hr. If core ΔT is 63.6°F, what is core bypass 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: 47

Which one of the following describes the method of core heat removal during reflux core cooling following a loss of coolant accident?

A. Convection with forced coolant flow.

B. Convection with natural circulation coolant flow.

C. Conduction with stagnant coolant flow.

D. Radiation with total core voiding.

QUESTION: 48

A reactor coolant system natural circulation cooldown is in progress using the steam generator (S/G) atmospheric steam relief valves, operated in manual control. Assume feed flow rate, relief valve position, and decay heat level remain constant.

If S/G tube high point voiding interrupts natural circulation, S/G steam flow rate will _____ and core exit thermocouple temperature will _____.

A. decrease; increase

B. decrease; remain constant

C. increase; increase

D. increase; remain constant

QUESTION: 49

A nuclear reactor is operating at 3,400 MW thermal power. The core linear power density limit is 12.2 kW/ft.

Given:

- The reactor core contains 198 fuel assemblies.
- Each fuel assembly contains 262 fuel rods, each with an active length of 12.0 feet
- The highest total peaking factors measured in the core are as follows:

  Location A: 2.5
  Location B: 2.4
  Location C: 2.3
  Location D: 2.2

Which one of the following describes the operating conditions in the core relative to the linear power density limit?

A. All locations in the core are operating below the linear power density limit.

B. Location A has exceeded the linear power density limit while the remainder of the core is operating below the limit.

C. Locations A and B have exceeded the linear power density limit while the remainder of the core is operating below the limit.

D. Locations A, B, and C have exceeded the linear power density limit while the remainder of the core is operating below the limit.

QUESTION: 50

A nuclear reactor is shut down for refueling following 18 months of operation at an average power level of 85%. During the shutdown, a reactor vessel metal specimen was removed from the reactor vessel for testing. The tests determined that the nil-ductility transition (NDT) temperature of the specimen has increased from 42°F to 72°F since the previous refueling shutdown.

Which one of the following conclusions is warranted?

A. The test results are credible and the reactor vessel is more likely to experience brittle fracture now than after the previous refueling shutdown.

B. The test results are credible and the reactor vessel is less likely to experience brittle fracture now than after the previous refueling shutdown.

C. The test results are questionable because the specimen NDT temperature would not increase during the described 18-month period of operation.

D. The test results are questionable because the specimen NDT temperature would increase by less than indicated during the described 18-month period of operation.

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

JUNE 2008 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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