UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2011--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 generic 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 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, 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 HANDOUT SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

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

$A = A_0e^{-\lambda t}$

$P = P_o10^{SUR(t)}$

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

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

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

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

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

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

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

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

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 = 3.41×10^6 Btu/hr

1 hp = 2.54×10^3 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 = 3.7×10^{10} dps

QUESTION: 1

Refer to the centrifugal pump operating curve with two system head loss curves (see figure below). The curves apply to an open cooling water system using one single-speed centrifugal pump discharging through a typical flow control valve.

One of the system curves shows system head loss with the flow control valve 25 percent open. The other system curve shows system head loss with the flow control valve 100 percent open. The pump is initially operating with the valve 25 percent open, resulting in a pump flow rate of 800 gpm.

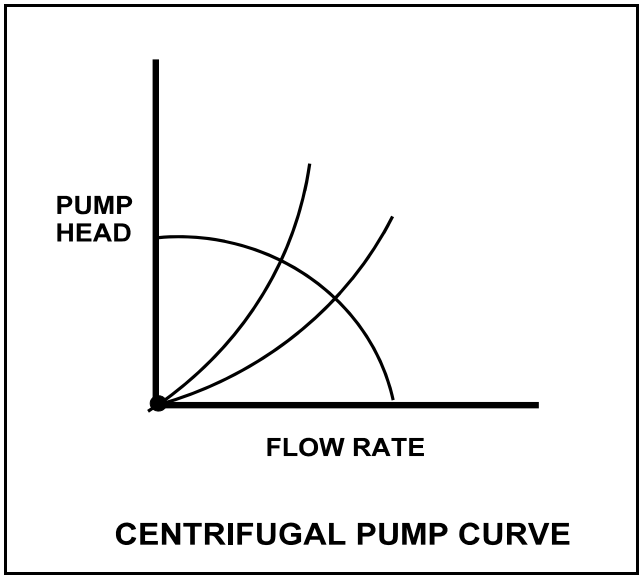
If the flow control valve is subsequently fully opened, pump flow rate through the valve will be approximately...

A. 400 gpm.

B. 1,200 gpm.

C. 1,600 gpm.

D. 3,200 gpm.



QUESTION: 2

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: 3

A steam flow measuring instrument uses density compensation and square root compensation to convert the differential pressure across a flow element to flow rate in lbm/hr.

The purpose of square root compensation in this flow measuring instrument is to convert _____ to _____.

A. volumetric flow rate; mass flow rate

B. volumetric flow rate; differential pressure

C. differential pressure; mass flow rate

D. differential pressure; volumetric flow rate

QUESTION: 4

A bourdon tube works on the principle that when the pressure inside the tube decreases, the tube tends to: (Assume detected pressure remains above atmospheric pressure.)

A. coil due to an increased pressure-induced force on the outside of the tube.

B. straighten due to an increased pressure-induced force on the outside of the tube.

C. coil due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.

D. straighten due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.

QUESTION: 5

A simple two-wire resistance temperature detector (RTD) is being used to measure the temperature of a water system. Copper extension wires run from the RTD to a temperature instrument 40 feet away. If the temperature of the extension wires decreases, the electrical resistance of the extension wires will _____, and the temperature indication will _____ unless temperature compensation is provided.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 6

In which usable region(s) of the gas-filled detector ionization curve is the pulse height resulting from the detection of a 1 MeV beta particle the same as a 5 MeV alpha particle?

A. Geiger-Mueller only.

B. Geiger-Mueller and Ionization Chamber.

C. Proportional only.

D. Proportional and Ionization Chamber.

QUESTION: 7

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

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

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

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

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

QUESTION: 8

A direct-acting proportional controller is being used to control the temperature of lube oil exiting a heat exchanger. The controller's proportional band is 80°F to 130°F.

Which one of the following will be the controller's output percentage when the measured lube oil temperature is 92°F?

A. 12 percent

B. 24 percent

C. 38 percent

D. 76 percent

QUESTION: 9

Refer to the drawing of a pneumatic control system (see figure below).

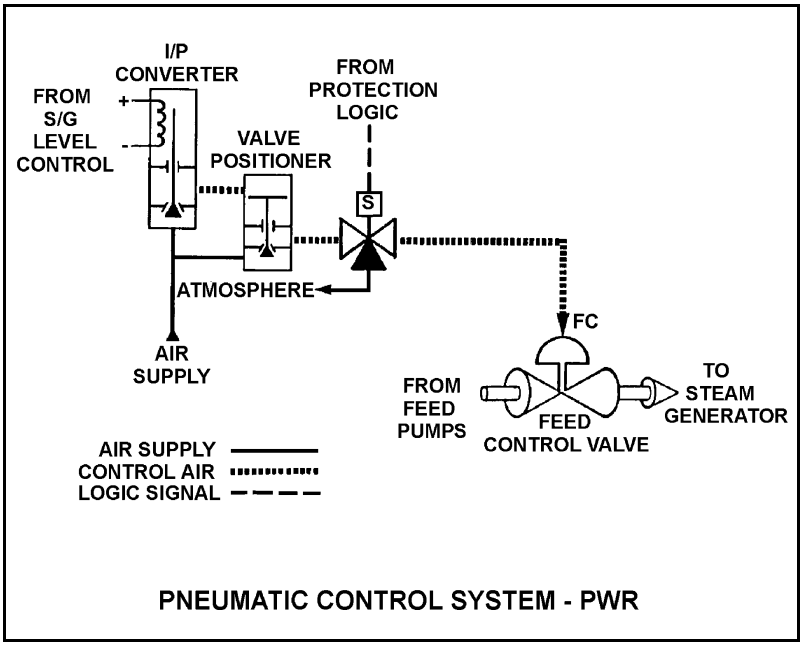
The purpose of the valve positioner is to convert...

A. a small control air pressure into a proportionally larger air pressure to adjust valve position.

B. a large control air pressure into a proportionally smaller air pressure to adjust valve position.

C. pneumatic force into mechanical force to adjust valve position.

D. mechanical force into pneumatic force to adjust valve position.



PNEUMATIC CONTROL SYSTEM - PWR

QUESTION: 10

The discharge valve for a radial flow centrifugal cooling water pump is closed in preparation for starting the pump.

After the pump is started, the following stable pump pressures are observed:

Pump discharge pressure: 30 psig
Pump suction pressure: 10 psig

With the discharge valve still closed, if the pump speed is doubled, what will be the new pump discharge pressure?

A. 80 psig

B. 90 psig

C. 120 psig

D. 130 psig

QUESTION: 11

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

Given:

- The tank is filled to a level of 26 feet with 60°F water.
- The pump is currently operating at 50 gpm.
- The pump requires 30 feet of net positive suction head.

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

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

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

C. The pump is currently <u>not</u> cavitating; pump flow rate will gradually decrease with tank level and then rapidly decrease when cavitation begins at a lower tank level.

D. The pump is currently <u>not</u> cavitating; pump flow rate will gradually decrease with tank level and then rapidly decrease as the pump becomes air bound when the tank empties.

QUESTION: 12

Refer to the drawing of a cooling water system in which only centrifugal pump A is operating and the common pump discharge valve is currently 90 percent open (see figure below).

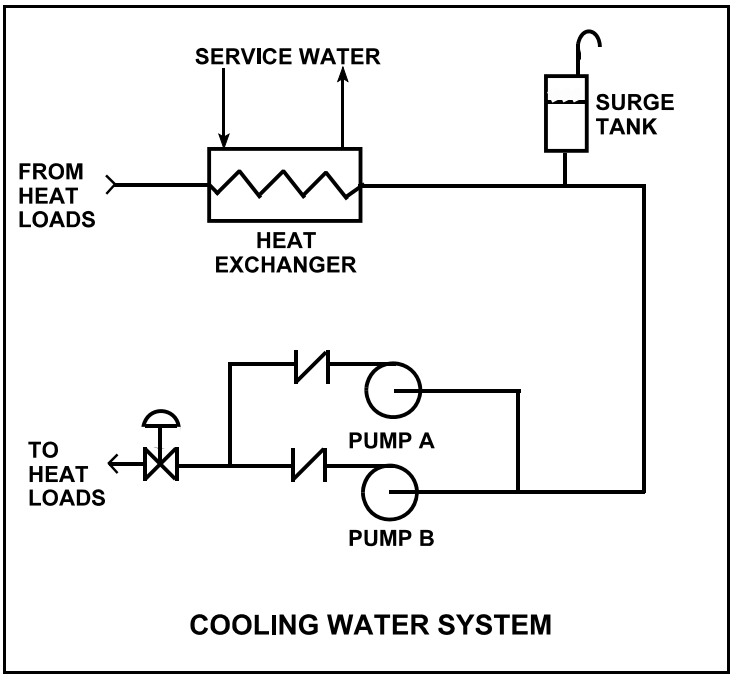
An abnormal total heat load on the cooling water system is causing pump A to approach operation at runout conditions. Which one of the following will cause pump A to operate farther away from runout conditions? (Assume that satisfactory available net positive suction head is maintained at all times.)

A. Starting pump B.

B. Positioning the discharge valve to 100 percent open.

C. Raising the water level in the surge tank by 2 feet.

D. Decreasing heat exchanger service water flow rate by 10 percent.



QUESTION: 13

An increase in positive displacement pump speed will cause the available net positive suction head for the pump to...

A. decrease due to the increase in fluid flow.

B. decrease due to the increase in fluid discharge pressure.

C. increase due to the increase in fluid discharge pressure.

D. increase due to the increase in fluid flow.

QUESTION: 14

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

100 MW
0 MVAR
2,625 amps
22 KV

If the main generator excitation current is decreased, the main generator amps will initially _____ and MW will initially _____.

A. decrease; decrease

B. increase; decrease

C. decrease; remain the same

D. increase; remain the same

QUESTION: 15

If the discharge valve of a large motor-driven centrifugal pump is kept closed during a normal pump start, the current indication for the AC induction motor will rise to...

A. approximately the full-load current value, and then decrease to the no-load current value.

B. approximately the full-load current value, and then stabilize at the full-load current value.

C. several times the full-load current value, and then decrease to the no-load current value.

D. several times the full-load current value, and then decrease to the full-load value.

QUESTION: 16

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

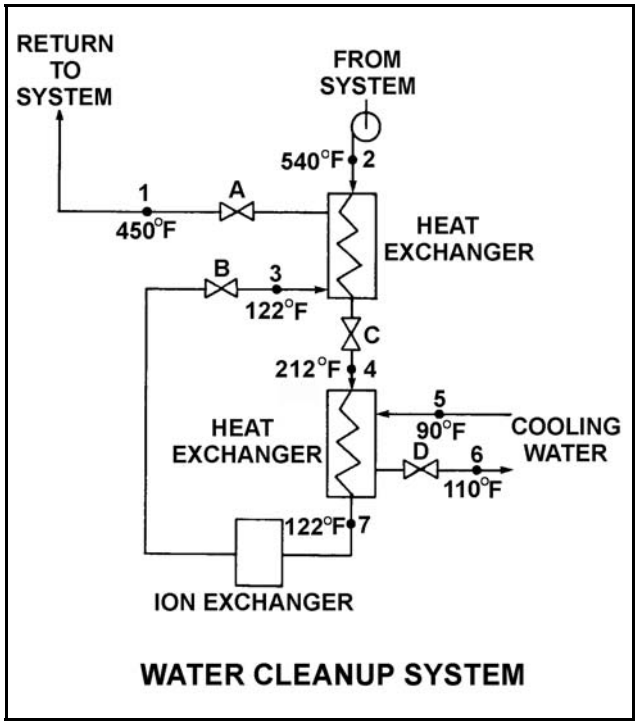
All valves are identical and are initially 50 percent open. To lower the temperature at point 4, the operator can adjust valve _____ in the _____ direction.

A. A; open

B. B; shut

C. C; open

D. D; shut



WATER CLEANUP SYSTEM

QUESTION: 17

A main turbine-generator is operating at 80 percent load with the following initial steady-state temperatures for the main turbine lube oil heat exchanger:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

After six months of main turbine operation, the following final steady-state lube oil heat exchanger temperatures are observed:

$T_{oil\ in}$ = 179°F
$T_{oil\ out}$ = 119°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Assume that the final cooling water and lube oil flow rates are the same as the initial flow rates, and that the specific heat values for the cooling water and lube oil do not change.

Which one of the following could be responsible for the differences between the initial and final heat exchanger steady-state temperatures?

A. The heat exchanger tubes have become fouled with scale.

B. The temperature of the cooling water source has increased.

C. The final main turbine-generator load is higher than the initial load.

D. The final main turbine-generator load is lower than the initial load.

QUESTION: 18

What percentage of ionic impurities is being removed from the water passing through an ion exchanger if the ion exchanger has a decontamination factor of 50?

A. 98 percent

B. 96 percent

C. 75 percent

D. 50 percent

QUESTION: 19

When a mixed-bed demineralizer resin is exhausted, the resin should be replaced or regenerated because...

A. ions previously removed by the resin will be released into solution.

B. the resin will fracture and possibly escape through the retention screens.

C. particles previously filtered out of solution will be released.

D. the resin will physically bond together, thereby causing a flow blockage.

QUESTION: 20

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

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

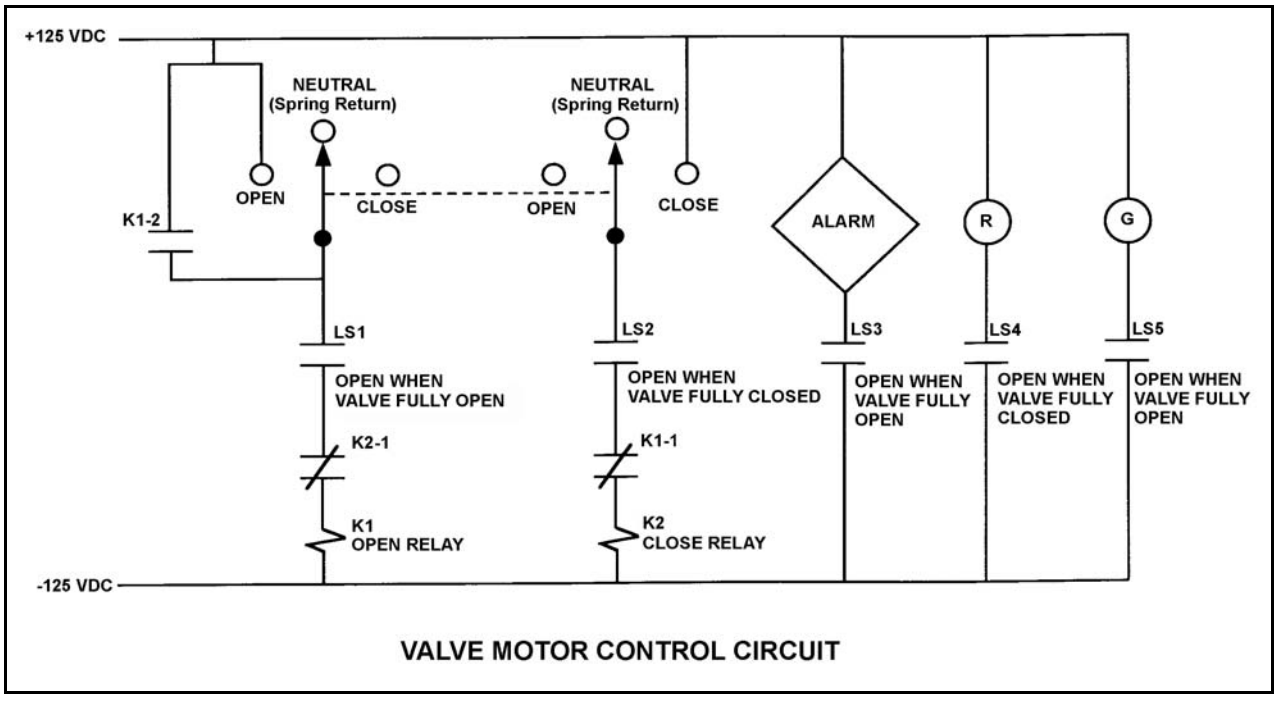
Which one of the following describes the valve response if the control switch is taken to the "Close" position for two seconds and then released?

A. The valve will not move.

B. The valve will close fully.

C. The valve will begin to close and then stop moving.

D. The valve will begin to close and then open fully.



VALVE MOTOR CONTROL CIRCUIT

QUESTION: 21

A main generator is about to be connected to an infinite power grid with the following conditions:

Generator frequency:	59.5 Hz
Grid frequency:	59.8 Hz
Generator voltage:	115.1 KV
Grid voltage:	114.8 KV

When the generator output breaker is closed the generator will...

A. acquire real load and reactive load.

B. acquire real load but become a reactive load to the grid.

C. become a real load to the grid but acquire reactive load.

D. become a real load and a reactive load to the grid.

QUESTION: 22

Typical high voltage electrical disconnects are designed to...

A. protect circuits during overcurrent conditions.

B. automatically trip open to protect breakers.

C. isolate equipment electrically during no-load conditions.

D. interrupt circuits under load.

QUESTION: 23

A neutron that is expelled 1.0×10^{-6} seconds after the associated fission event is a _____ neutron.

A. thermal

B. prompt

C. capture

D. delayed

QUESTION: 24

Nuclear reactors A and B are identical except that reactor A is operating near the beginning of a fuel cycle (BOC) and reactor B is operating near the end of a fuel cycle (EOC). Both reactors are operating at 100 percent power with all control rods fully withdrawn.

If the total reactivity worth of the control rods is the same for both reactors, which reactor will have the smaller K_{eff} five minutes after a reactor trip, and why?

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

B. Reactor A, because the concentration of U-235 in the fuel rods is higher near the BOC.

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

D. Reactor B, because the concentration of U-235 in the fuel rods is lower near the EOC.

QUESTION: 25

Two nuclear reactors are identical except that reactor A is near the end of a fuel cycle and reactor B is near the beginning of a fuel cycle. Both reactors are critical at 1.0×10^{-5} percent power.

If the same amount of positive reactivity is added to each reactor at the same time, the point of adding heat will be reached first by reactor _____ because it has a _____ delayed neutron fraction.

A. A; smaller

B. A; larger

C. B; smaller

D. B; larger

QUESTION: 26

Which one of the following 10 percent power level changes produces the largest amount of negative reactivity from the fuel temperature coefficient? (Assume that each power level change produces the same increase/decrease in fuel temperature.)

A. 30 percent to 40 percent.

B. 30 percent to 20 percent.

C. 80 percent to 90 percent.

D. 80 percent to 70 percent.

QUESTION: 27

As reactor coolant boron concentration is reduced, the differential boron reactivity worth (ΔK/K per ppm) becomes...

A. less negative due to the increased number of water molecules in the core.

B. less negative due to the decreased number of boron molecules in the core.

C. more negative due to the increased number of water molecules in the core.

D. more negative due to the decreased number of boron molecules in the core.

QUESTION: 28

Criticality has been achieved during a xenon-free nuclear reactor startup. The core neutron flux level is low in the intermediate range with a stable 0.5 dpm startup rate (SUR). The operator begins inserting control rods in an effort to stabilize the core neutron flux level near its current value. The operator stops inserting control rods when the SUR indicates exactly 0.0 dpm.

Immediately after the operator stops inserting the control rods, the SUR will become _____; and the core neutron flux level will _____.

A. positive; increase exponentially

B. positive; increase linearly

C. negative; decrease exponentially

D. negative; decrease linearly

QUESTION: 29

Control rod insertion limits ensure that control rods will be more withdrawn as reactor power _____ to compensate for the change in _____.

A. increases; xenon reactivity

B. decreases; xenon reactivity

C. increases; power defect

D. decreases; power defect

QUESTION: 30

A nuclear reactor is initially operating at 100 percent power with equilibrium core xenon-135. Power is decreased to 50 percent over a 1-hour period and average reactor coolant temperature is adjusted to 572°F using manual rod control. Rod control is left in Manual and no subsequent operator actions are taken.

Considering only the reactivity effects of core xenon-135 changes, which one of the following describes the average reactor coolant temperature 10 hours after the power change is completed?

A. Less than 572°F and increasing slowly.

B. Less than 572°F and decreasing slowly.

C. Greater than 572°F and increasing slowly.

D. Greater than 572°F and decreasing slowly.

QUESTION: 31

A nuclear power plant was operating at 100 percent power for 3 months near the beginning of a fuel cycle when a reactor trip occurred. Eighteen hours later, the reactor is critical at the point of adding heat with normal operating reactor coolant temperature and pressure. Power level will be raised to 100 percent over the next 3 hours.

During this power level increase, most of the positive reactivity added by the operator will be required to overcome the negative reactivity from...

A. fuel burnup.

B. xenon-135 buildup.

C. fuel temperature increase.

D. moderator temperature increase.

QUESTION: 32

Refer to the drawing of K_{eff} versus core age for a nuclear reactor core following a refueling outage (see figure below).

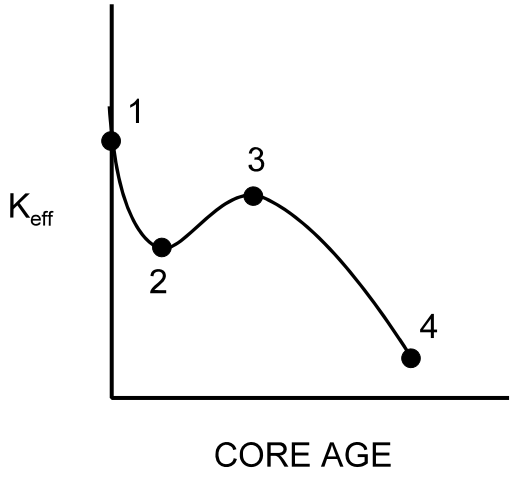
Which one of the following is responsible for the majority of the decrease in K_{eff} from point 1 to point 2?

A. Depletion of fuel

B. Burnout of burnable poisons

C. Initial heat-up of the reactor

D. Buildup of fission product poisons



QUESTION: 33

During a nuclear reactor startup, the first positive reactivity addition caused the stable count rate to increase from 20 cps to 30 cps. The second positive reactivity addition caused the stable count rate to increase from 30 cps to 60 cps. Assume K_{eff} was 0.97 prior to the first reactivity addition.

Which one of the following statements describes the magnitude of the reactivity additions?

A. The first reactivity addition was approximately 50 percent larger than the second.

B. The second reactivity addition was approximately 50 percent larger than the first.

C. The first and second reactivity additions were approximately equal.

D. There is not enough information given to determine the relationship of the reactivity values.

QUESTION: 34

An estimated critical rod position (ECP) has been calculated for a nuclear reactor startup to be performed 15 hours after a reactor trip from long term 100 percent power operation. Which one of the following conditions would cause the actual critical rod position to be higher than the predicted critical rod position?

A. A 90 percent value for reactor power was used for power defect determination in the ECP calculation.

B. Reactor criticality is achieved approximately 2 hours earlier than anticipated.

C. Steam generator pressures are decreased by 100 psi just prior to criticality.

D. Current boron concentration is 10 ppm lower than the value used in the ECP calculation.

QUESTION: 35

A nuclear reactor is initially critical at 10,000 cps when a steam generator atmospheric relief valve fails open. Assume end of fuel cycle conditions, no reactor trip, and no operator actions are taken.

When the reactor stabilizes, the reactor coolant average temperature (T_{ave}) will be _____ than the initial T_{ave} and reactor power will be _____ the point of adding heat.

A. greater; at

B. greater; above

C. less; at

D. less; above

QUESTION: 36

A nuclear reactor is critical below the point of adding heat (POAH). The operator adds enough reactivity to attain a startup rate of 0.5 decades per minute. Which one of the following will decrease <u>first</u> when the reactor reaches the POAH?

A. Pressurizer level

B. Reactor coolant temperature

C. Reactor power

D. Startup rate

QUESTION: 37

Which one of the following is arranged from the lowest pressure to the highest pressure?

A. 2 psig, 12 inches Hg absolute, 8 psia

B. 2 psig, 18 inches Hg absolute, 8 psia

C. 12 psia, 20 inches Hg absolute, 2 psig

D. 12 psia, 30 inches Hg absolute, 2 psig

QUESTION: 38

Consider a saturated water/steam 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

A nuclear power plant experienced a loss of all AC electrical power due to a natural disaster. A few days later, there is turbulent boiling in the spent fuel pool. Average spent fuel temperature is elevated but stable. Assume that boiling is the only means of heat removal from the spent fuel pool.

Given the following stable current conditions:

Spent fuel decay heat rate: 4.8 MW
Spent fuel building pressure: 14.7 psia
Spent fuel pool temperature: 212°F

At what approximate rate is the mass of water in the spent fuel pool decreasing?

A. 4,170 lbm/hr

B. 4,950 lbm/hr

C. 14,230 lbm/hr

D. 16,870 lbm/hr

QUESTION: 40

Which one of the following is the condensate depression in a steam condenser operating at 2.0 psia with a condensate temperature of 115°F?

A. 9°F

B. 11°F

C. 13°F

D. 15°F

QUESTION: 41

Feed water heating increases overall nuclear power plant thermal efficiency because...

A. less power is required by the feed water pumps to pump the warmer feed water.

B. less steam flow passes through the turbine, thereby increasing turbine efficiency.

C. the average temperature at which heat is transferred in the steam generators is increased.

D. increased feed water temperature lowers the temperature at which heat is rejected in the condenser.

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 65°F upstream of valve A, and 85°F upstream of valve B.

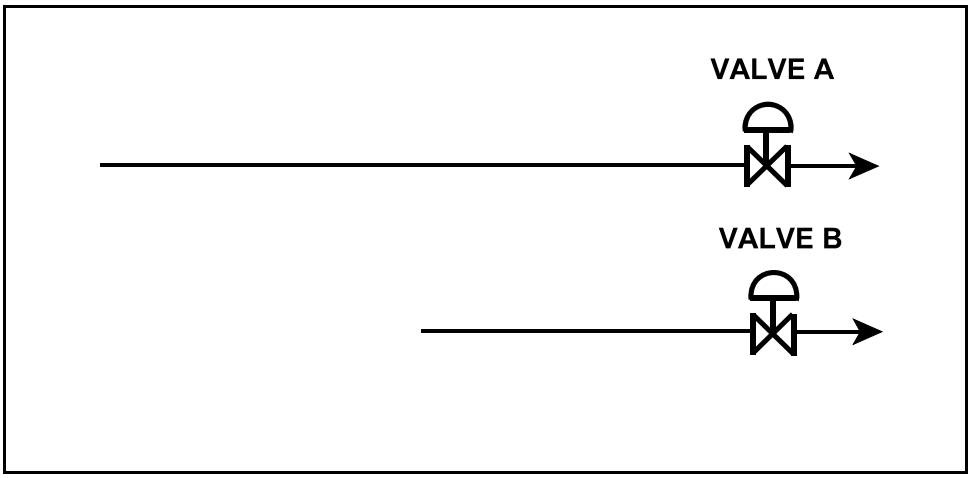
For which case(s), if any, will valve A experience a pressure spike that is greater than the pressure spike at valve B?

A. Case 1 only

B. Case 2 only

C. Both cases

D. Neither case



QUESTION: 43

Cavitation of a centrifugal pump in an open system is indicated by _____ discharge pressure and _____ flow rate.

A. low; low

B. high; high

C. low; high

D. high; low

QUESTION: 44

Why is bulk boiling in the tubes of a single-phase heat exchanger undesirable?

A. The bubble formation will break up the laminar layer in the heat exchanger tubes.

B. The turbulence will restrict fluid flow through the heat exchanger tubes.

C. The ΔT across the tubes will decrease through the heat exchanger.

D. The thermal conductivity of the heat exchanger tubes will decrease.

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. subcooled nucleate boiling.

B. stable film boiling.

C. saturated nucleate boiling.

D. transition boiling.

QUESTION: 46

If a nuclear reactor is operating with the departure from nucleate boiling ratio (DNBR) at its limit, which one of the following is indicated?

A. None of the fuel rods are experiencing critical heat flux.

B. A small fraction of the fuel rods may be experiencing critical heat flux.

C. All radioactive fission products are being contained within the reactor fuel.

D. All radioactive fission products are being contained within either the reactor fuel or the reactor vessel.

QUESTION: 47

A few minutes ago, a nuclear power plant experienced a loss of offsite power that caused a reactor trip and a loss of all reactor coolant pumps. Natural circulation flow is currently developing in the reactor coolant system (RCS).

Which one of the following operator actions will enhance RCS natural circulation flow rate?

A. Establish and maintain saturation conditions in the RCS.

B. Establish and maintain a steam bubble in the reactor vessel.

C. Establish and maintain steam generator pressure above RCS pressure.

D. Establish and maintain steam generator water level high in the normal operating range.

QUESTION: 48

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: 49

Consider a new fuel rod operating at a constant power level for several weeks. During this period, fuel densification in the fuel rod causes the heat transfer rate from the fuel pellets to the cladding to _____; which causes the average fuel temperature in the fuel rod to _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 50

Two identical nuclear reactors are currently shut down for refueling. Reactor A has an average lifetime power capacity of 90 percent and has been operating for 16 years. Reactor B has an average lifetime power capacity of 80 percent and has been operating for 18 years.

Which reactor, if any, will have the lowest reactor vessel nil ductility transition temperature, and why?

A. Reactor A due to the higher average lifetime power capacity.

B. Reactor B due to the lower average lifetime power capacity.

C. Both reactors will have approximately the same nil ductility transition temperature because each core has produced approximately the same number of fissions.

D. Both reactors will have approximately the same nil ductility transition temperature because fast neutron irradiation in a shut down core is not significant.

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

SEPTEMBER 2011 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	D
3	17	D	28	42	A
4	18	C	29	43	C
5	19	D	30	44	A
6	20	A	31	45	C
7	21	C	32	46	D
8	22	B	33	47	C
9	23	A	34	48	B
10	24	B	35	49	D
11	25	D	36	50	D
12	26	A	37	1	D
13	27	A	38	2	B
14	28	D	39	3	D
15	29	C	40	4	B
16	30	B	41	5	C
17	31	A	42	6	B
18	32	A	43	7	A
19	33	A	44	8	B
20	34	C	45	9	D
21	35	C	46	10	B
22	36	C	47	11	D
23	37	D	48	12	B
24	38	A	49	13	C
25	39	A	50	14	C