UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2006--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 starts. 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 booklet, then 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

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

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

$Q = UA\Delta T$

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

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

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

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

$SUR = 26.06/\tau$

$\tau = \dfrac{\bar{\beta} \cdot \rho}{\lambda_{eff}\, \rho}$

$\rho = \dfrac{R^*}{\tau} + \dfrac{\bar{\beta}}{1 + \lambda_{eff}\tau}$

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

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

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

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

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

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

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

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

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

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

$W_{Pump} = \dot{m} \Delta P \upsilon$

$E = IR$

Eff. = Net Work Out/Energy In

$$\frac{g(z_2 - z_1)}{g_c} + \frac{(v_2^2 - v_1^2)}{2g_c} + \upsilon(P_2 - P_1) + (u_2 - u_1) + (q - w) = 0$$

$g_c = 32.2$ 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
EC	= (5/9)(EF - 32)	1 ft^3_{water}	= 7.48 gal
EF	= (9/5)(EC) + 32		

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. The valve is located on the discharge piping of the pump.

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

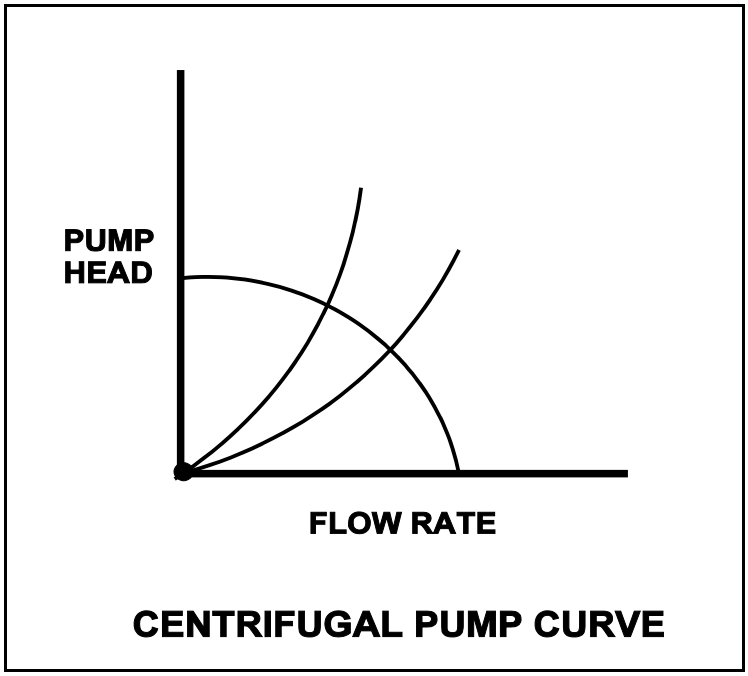
If the flow control valve is subsequently fully opened, pump flow rate through the valve will be approximately...

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 when needed to isolate packing leakage.

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

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 properly calibrated water flow detector is located several feet below a horizontal pipe containing the detector's sensing element. The detector is removed for inspection and then reconnected to the sensing element with its low-pressure sensing line filled with air and its high-pressure sensing line filled with water.

If the water system is operating, indicated flow rate will be...

A. zero.

B. equal to actual flow rate but greater than zero.

C. lower than actual flow rate.

D. higher than actual flow rate.

QUESTION: 4

A cooling water system uses a horizontal venturi with a differential pressure flow detector to provide cooling water flow rate indication. Water enters and leaves the venturi at 70EF, 100 psig and 24 ft/sec. Water velocity at the throat of the venturi is 50 ft/sec. Assume water is incompressible and the venturi experiences no unrecoverable head loss.

What is the approximate pressure of the water at the throat of the venturi?

A. 98 psig

B. 94 psig

C. 87 psig

D. 74 psig

QUESTION: 5

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

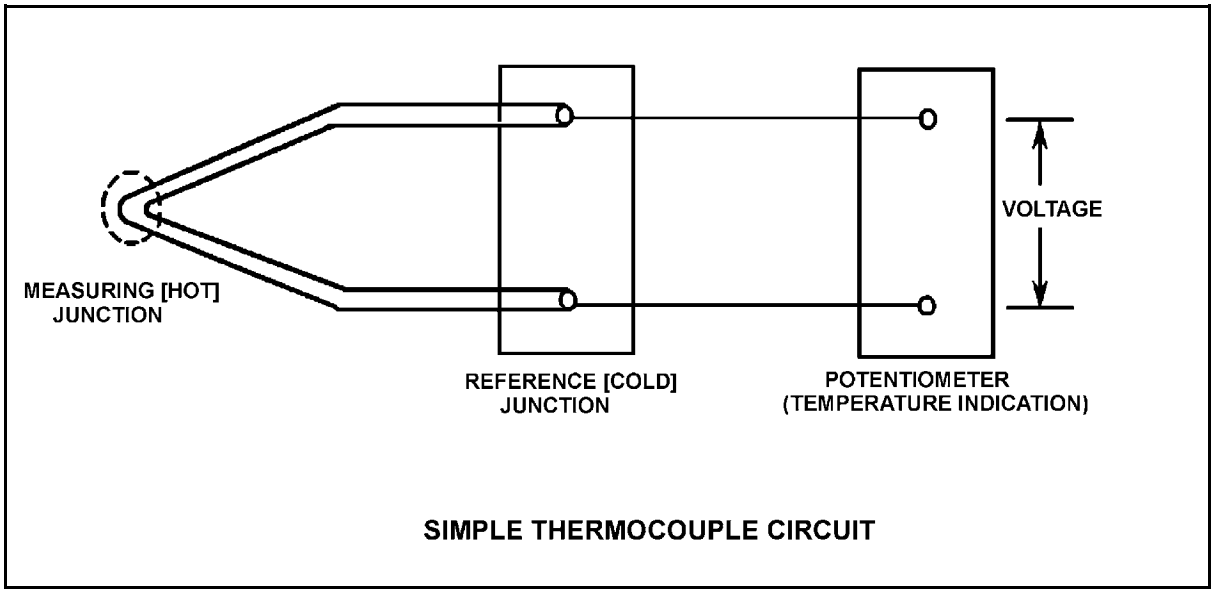
Thermocouple temperature indication is currently 350EF. A small steam leak occurs that raises reference (cold) junction temperature by 20EF. Assume measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 310EF.

B. 330EF.

C. 370EF.

D. 390EF.



SIMPLE THERMOCOUPLE CIRCUIT

QUESTION: 6

Select the option that correctly fills in the blanks.

Quench gases are added to gas-filled radiation detectors that operate in the _____ region; the quench gases prevent a single ionization event from causing _____ in the detector gas volume.

A. ion chamber; multiple discharges

B. ion chamber; secondary ionizations

C. Geiger-Mueller; multiple discharges

D. Geiger-Mueller; secondary ionizations

QUESTION: 7

An emergency diesel generator (D/G) is the only power source connected to an emergency bus. The governor of the D/G directly senses D/G _____ and adjusts D/G fuel flow to maintain a relatively constant D/G _____.

A. voltage; voltage

B. voltage; frequency

C. speed; voltage

D. speed; frequency

QUESTION: 8

Refer to the drawing of a lube oil temperature control system (see figure below). The temperature control valve is currently 50% open.

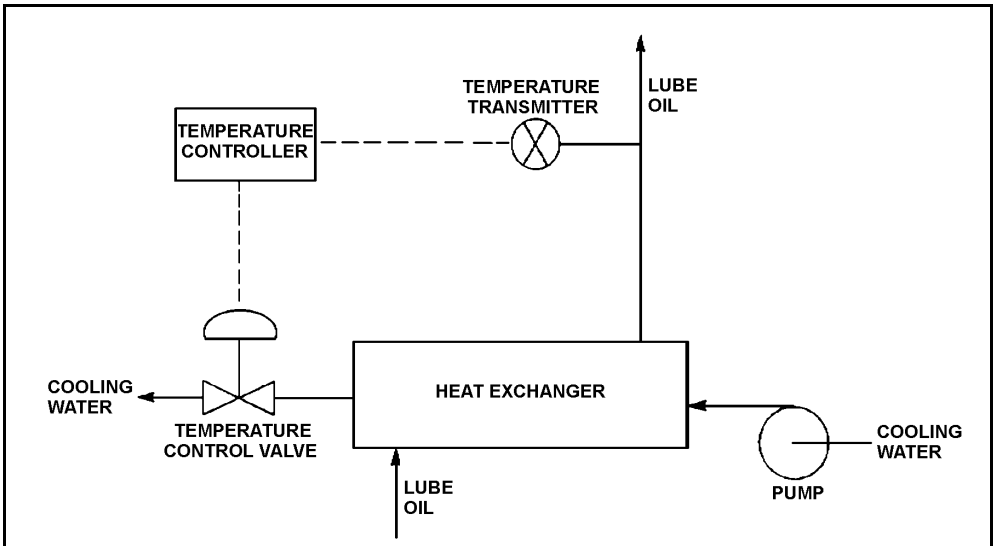
If the cooling water inlet temperature decreases, the temperature controller will position the temperature control valve more _____, causing cooling water differential temperature through the heat exchanger to _____.

A. closed; increase

B. closed; decrease

C. open; increase

D. open; decrease



LUBE OIL TEMPERATURE CONTROL SYSTEM

QUESTION: 9

What precaution must be observed when transferring a valve controller from the automatic mode to the manual mode of control?

A. Ensure that a substantial deviation is established between the automatic and manual valve controller outputs.

B. Ensure that the automatic and manual valve controller outputs are matched.

C. Ensure that the automatic valve controller output is increasing before transferring to the manual mode of control.

D. Ensure that the automatic valve controller output is decreasing before transferring to the manual mode of control.

QUESTION: 10

Which one of the following would result from operating a motor-driven centrifugal pump for extended periods of time with the discharge valve shut and no recirculation flow?

A. No motor damage, but the pump will overheat and may be damaged.

B. No motor damage, but the pump will overspeed and may be damaged.

C. No pump damage, but the motor will overspeed and the motor bearings may fail.

D. No pump damage, but the motor windings will draw excessive current and may fail.

QUESTION: 11

A 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:	70EF

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 60EF with no change in pump flow rate.

B. The temperature of the cooling water being pumped increased to 80EF 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

Which one of the following specifies the proper pump discharge valve position and the basis for that position when starting a large centrifugal pump?

A. Discharge valve throttled to reduce motor power requirements.

B. Discharge valve fully open to reduce motor power requirements.

C. Discharge valve throttled to ensure adequate pump net positive suction head.

D. Discharge valve fully open to ensure adequate pump net positive suction head.

QUESTION: 13

A pump is needed to supply fuel oil from a day tank to a diesel fuel injection system. The pump must maintain a nearly constant flow rate with a minimum of discharge pressure fluctuations as system pressure varies between 200 psig and 1,900 psig.

Which one of the following types of pumps would typically be used in this application?

A. Axial flow centrifugal

B. Radial flow centrifugal

C. Rotary positive displacement

D. Reciprocating positive displacement

QUESTION: 14

A main generator is operating and is connected to an infinite power grid with the following initial generator parameters:

Terminal Voltage:	22 KV
Frequency:	60 Hertz
Load--Real:	575 MW
Load--Reactive:	100 MVAR (in)
Power Factor:	0.985

Which one of the following contains a combination of manual adjustments to the main generator voltage regulator and speed control setpoints such that <u>each</u> adjustment will result in a decrease in main generator amps? (Assume that generator power factor remains less than 1.0.)

	VOLTAGE SETPOINT	SPEED SETPOINT
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease

QUESTION: 15

Two identical 4160 Vac induction motors are connected to identical centrifugal pumps. The pumps are used to provide flow in two separate but identical cooling water systems in a nuclear power plant. Each motor is rated at 400 hp. The discharge valve for pump A is fully shut and the discharge valve for pump B is fully open.

If each motor is then started, the longer time period required to stabilize motor current will be experienced by motor _____ and the higher stable motor current will be experienced by motor _____.

A. A; A

B. A; B

C. B; A

D. B; B

QUESTION: 16

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

Given the following initial parameters:

Cooling water inlet temperature (T_{cw-in}) = 75EF
Cooling water outlet temperature (T_{cw-out}) = 95EF
Oil inlet temperature (T_{oil-in}) = 150EF
Oil outlet temperature ($T_{oil-out}$) = 110EF

Air leakage into the heat exchanger causes some of the heat exchanger tubes to become uncovered. As a result, T_{cw-out} decreases to 89EF. Assume the inlet temperatures, mass flow rates, and specific heats of both fluids remain the same.

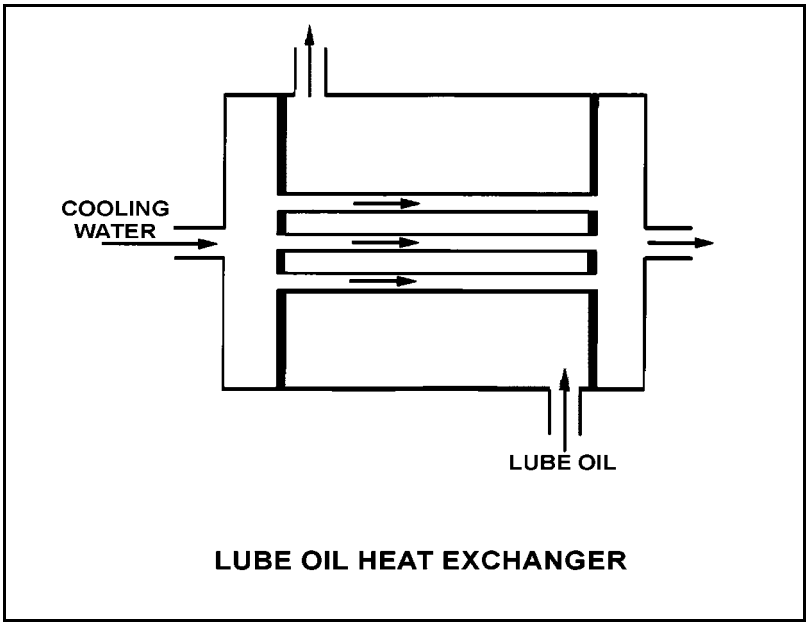
Which one of the following will be the new approximate temperature of the oil exiting the heat exchanger ($T_{oil-out}$)?

A. 116EF

B. 122EF

C. 130EF

D. 138EF



LUBE OIL HEAT EXCHANGER

QUESTION: 17

During normal nuclear power plant operation, why does air entry into the main condenser reduce the thermodynamic efficiency of the steam cycle?

A. The rate of steam flow through the main turbine increases.

B. The condensate subcooling in the main condenser increases.

C. The enthalpy of the low pressure turbine exhaust increases.

D. The air mixes with the steam and enters the condensate.

QUESTION: 18

A nuclear power plant has been operating normally at 100% power for one month and with the same reactor coolant boron concentration for the last 24 hours.

Which one of the following changes associated with an in-service reactor coolant letdown demineralizer will cause an increase in reactor coolant boron concentration in the demineralizer effluent?

A. Increase the temperature of the reactor coolant being processed from 95EF to 105EF.

B. Decrease the temperature of the reactor coolant being processed from 105EF to 95EF.

C. Increase the flow rate of reactor coolant being processed from 75 gpm to 100 gpm.

D. Decrease the flow rate of reactor coolant being processed from 75 gpm to 50 gpm.

QUESTION: 19

Prior to a scheduled nuclear power plant shutdown, the reactor coolant system was chemically shocked to induce a crud burst. What effect will the crud burst have on the in-service reactor coolant letdown demineralizers?

A. Decreased demineralizer outlet conductivity

B. Decreased pressure drop across the demineralizers

C. Increased flow rate through the demineralizers

D. Increased radiation levels around the demineralizers

QUESTION: 20

Which one of the following describes the normal operation of a local breaker overcurrent trip flag indicator?

A. Actuates when no lockout is present; satisfies an electrical interlock to remotely close a breaker.

B. Actuates when a breaker overcurrent trip has occurred; can be manually reset when the overcurrent condition clears.

C. Actuates when a breaker has failed to trip on an overcurrent condition; can be manually reset when the overcurrent condition clears.

D. Actuates to cause a breaker trip when the overcurrent trip setpoint is reached; can be remotely reset when the overcurrent condition clears.

QUESTION: 21

A nuclear power plant is operating at 80% power in the middle of a fuel cycle. The main generator is connected to an infinite power grid with the following initial main generator output parameters:

Frequency:	60 Hz
Voltage:	25 KV
Reactive Load:	300 MVAR (out)
Real Load:	800 MW

A hydraulic oil system malfunction causes the main turbine steam inlet valves to begin to slowly drift closed. Over the next 10 minutes, the main generator real load decreases to 600 MW.

Assuming no operator actions were taken during the above 10 minutes, how have the following main generator output parameters been affected?

	Frequency	Voltage	Reactive Load
A.	Decreased	Decreased	No change
B.	Decreased	No change	Decreased
C.	No change	No change	No change
D.	No change	Decreased	Decreased

QUESTION: 22

While remotely investigating the condition of a normally-open 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 normal voltage.
MCC ammeter indicates zero amperes.

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

A. open; in

B. closed; in

C. open; out

D. closed; out

QUESTION: 23

In a comparison between a delayed neutron and a prompt neutron born from the same fission event, the delayed neutron is more likely to...

A. leak out of the core.

B. cause fission of a U-238 nucleus.

C. become a thermal neutron.

D. cause fission of a Pu-240 nucleus.

QUESTION: 24

Which term is described by the following?

"The fractional change of the effective multiplication factor from criticality."

A. 1/M

B. K_{eff}

C. Reactor period

D. Reactivity

QUESTION: 25

A nuclear power plant that has been operating at rated power for two months experiences a reactor trip. Two months after the reactor trip, with all control rods still fully inserted, a stable count rate of 20 cps is indicated on the source/startup range nuclear instruments.

The majority of the source/startup range detector output is being caused by the interaction of _____ with the detector.

A. intrinsic source neutrons

B. fission gammas from previous power operation

C. fission neutrons from subcritical multiplication

D. delayed fission neutrons from previous power operation

QUESTION: 26

Select the option below that completes the following statement.

If the temperature of a fuel pellet decreases by 50EF, the U-238 microscopic cross-section for absorption of neutrons at resonance energy peaks will _____; and the U-238 microscopic cross-section for absorption of neutrons at energies that are slightly higher or lower than the resonance energy peaks will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 27

Given the following initial parameters:

Reactor power	= 100%
Total power coefficient	= -0.020% ΔK/K/%
Boron worth	= -0.010% ΔK/K/ppm
Rod worth	= -0.025% ΔK/K/inch inserted
Initial reactor coolant system (RCS) boron concentration	= 500 ppm

Which one of the following is the final RCS boron concentration required to support decreasing plant power to 30% by boration/dilution with 20 inches of inward control rod motion? (Assume no change in core xenon reactivity.)

A. 410 ppm

B. 425 ppm

C. 575 ppm

D. 590 ppm

QUESTION: 28

Criticality has been achieved during a xenon-free nuclear reactor startup. The core neutron flux level is low in the intermediate range and a stable 0.5 dpm startup rate (SUR) has been established. 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 exactly when the SUR indicates 0.0 dpm.

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

A. positive; increase exponentially

B. positive; increase linearly

C. negative; decrease exponentially

D. negative; decrease linearly

QUESTION: 29

A nuclear reactor has been operating at 100% power for 3 weeks shortly after a refueling outage. All control rods are fully withdrawn,. Which one of the following describes why most of the power is being produced in the lower half of the core?

A. The fuel loading in the lower half of the core contains a higher U-235 enrichment.

B. Reactor coolant boron is adding more negative reactivity in the upper half of the core.

C. There is a greater concentration of Xe-135 in the upper half of the core.

D. The moderator temperature coefficient of reactivity is adding more negative reactivity in the upper half of the core.

QUESTION: 30

A nuclear reactor is initially operating at 100% power with equilibrium core xenon-135. Power is decreased to 50% over a 1-hour period and average reactor coolant temperature is adjusted to 572EF 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 572EF and increasing slowly.

B. Less than 572EF and decreasing slowly.

C. Greater than 572EF and increasing slowly.

D. Greater than 572EF and decreasing slowly.

QUESTION: 31

After a reactor shutdown from equilibrium core xenon conditions, the maximum xenon -135 negative reactivity (height of the xenon peak) is _____ preshutdown equilibrium power level.

A. independent of

B. directly proportional to

C. inversely proportional to

D. dependent on but not directly proportional to

QUESTION: 32

Just prior to a refueling outage, the 100% power reactor coolant boron concentration was 50 ppm. However, immediately following the outage the 100% power boron concentration is 1,000 ppm.

Assume that burnable poisons were installed during the outage. Also assume that control rods are fully withdrawn from the core at 100% power for both cases.

Which one of the following contributes to the need for a much higher 100% power reactor coolant boron concentration at the beginning of a fuel cycle (BOC) compared with the end of a fuel cycle (EOC)?

A. The negative reactivity from burnable poisons is greater at BOC than at EOC.

B. The negative reactivity from fission product poisons is smaller at BOC than at EOC.

C. The positive reactivity from the fuel in the core is smaller at BOC than at EOC.

D. The positive reactivity from a unit withdrawal of a typical control rod is greater at BOC than at EOC.

QUESTION: 33

During a nuclear reactor startup, the first positive reactivity addition caused the count rate to increase from 20 to 30 cps. The second positive reactivity addition caused the count rate to increase from 30 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% larger than the second.

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

C. The first and second reactivity additions were approximately the same.

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

QUESTION: 34

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 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: 35

A refueling outage has just been completed in which the entire core was offloaded and replaced with new fuel. A reactor startup has been performed and power is being increased to 100%.

Which one of the following pairs of reactor fuels will be providing the greatest contribution to core heat production when the reactor reaches 100% power?

A. U-235 and U-238

B. U-238 and Pu-239

C. U-235 and Pu-239

D. U-235 and Pu-241

QUESTION: 36

A nuclear reactor is critical just below the point of adding heat when an inadvertent reactor trip occurs. All control rods fully insert except for one rod, which remains fully withdrawn. Five minutes after the reactor trip, with reactor startup rate (SUR) stable at approximately -1/3 dpm, the remaining withdrawn control rod suddenly drops (fully inserts).

Which one of the following describes the reactor response to the drop of the last control rod?

A. SUR will remain stable at approximately -1/3 dpm.

B. SUR will immediately become more negative, and then return to and stabilize at approximately -1/3 dpm.

C. SUR will immediately become more negative, and then turn and stabilize at a value more negative than -1/3 dpm.

D. SUR will immediately become more negative, and then turn and stabilize at a value less negative than -1/3 dpm.

QUESTION: 37

Refer to the drawing of four identical tank differential pressure (D/P) level detectors with different piping configurations (see figure below).

The tanks are identical and are presently at 2 psig overpressure, the same constant water level, and a temperature of 60EF. They are surrounded by atmospheric pressure. All level detectors have been calibrated and are producing the same level indication. A leak in the top of each tank causes a complete loss of overpressure in both tanks.

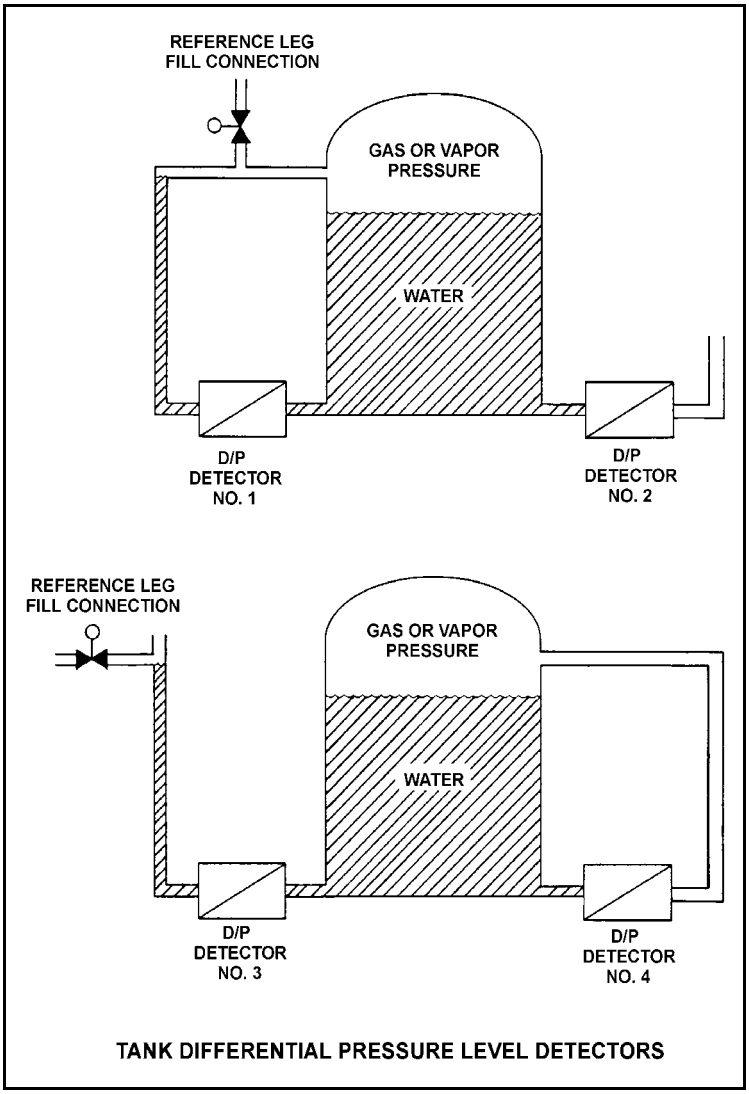
Which level detector(s) will produce the highest level indication?

A. No. 1 only

B. No. 2 only

C. No. 1 and 4

D. No. 2 and 3



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

QUESTION: 38

Two identical pressurizers are connected to the same location on two identical reactor coolant systems operating at 1,000 psia. Pressurizer A volume contains 50% saturated water and 50% saturated steam. Pressurizer B volume contains 50% subcooled water (300EF) and 50% nitrogen.

Which one of the following explains which pressurizer will maintain the highest pressure following a sudden 10% liquid outsurge from each pressurizer?

A. Pressurizer A due to vaporizing of saturated water as pressure begins to decrease

B. Pressurizer A due to the expansion characteristics of saturated steam being better than the expansion characteristics of nitrogen

C. Pressurizer B due to the subcooled water resulting in a smaller amount of energy being lost upon the outsurge

D. Pressurizer B due to the expansion characteristics of nitrogen being better than the expansion characteristics of saturated steam

QUESTION: 39

An open vessel contains one pound-mass of water at 204EF and standard atmospheric pressure. If 16.0 Btu of heat is added to the water, the water temperature will rise by about _____; and approximately _____ of the water mass will become vapor.

A. 8EF; 1 percent

B. 8EF; 10 percent

C. 16EF; 1 percent

D. 16EF; 10 percent

QUESTION: 40

A nuclear power plant is operating at 80% of rated power with 5EF of condensate depression in the main condenser. If the condensate depression increases to 10EF, plant efficiency will _____ and the probability of condensate pump cavitation will _____.

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase

QUESTION: 41

Turbine X is an ideal steam turbine that exhausts to a condenser at 1.0 psia. Turbine X is driven by saturated steam (100% quality) at 500 psia. Which one of the following lists the approximate specific work output of turbine X and the moisture content of the steam exiting turbine X?

	Specific Work	Moisture Content
A.	388 Btu/lbm	72%
B.	388 Btu/lbm	28%
C.	817 Btu/lbm	72%
D.	817 Btu/lbm	28%

QUESTION: 42

Refer to the drawing of a cooling water system in which only pump A is operating and the pump discharge valve is currently 50% open (see figure below).

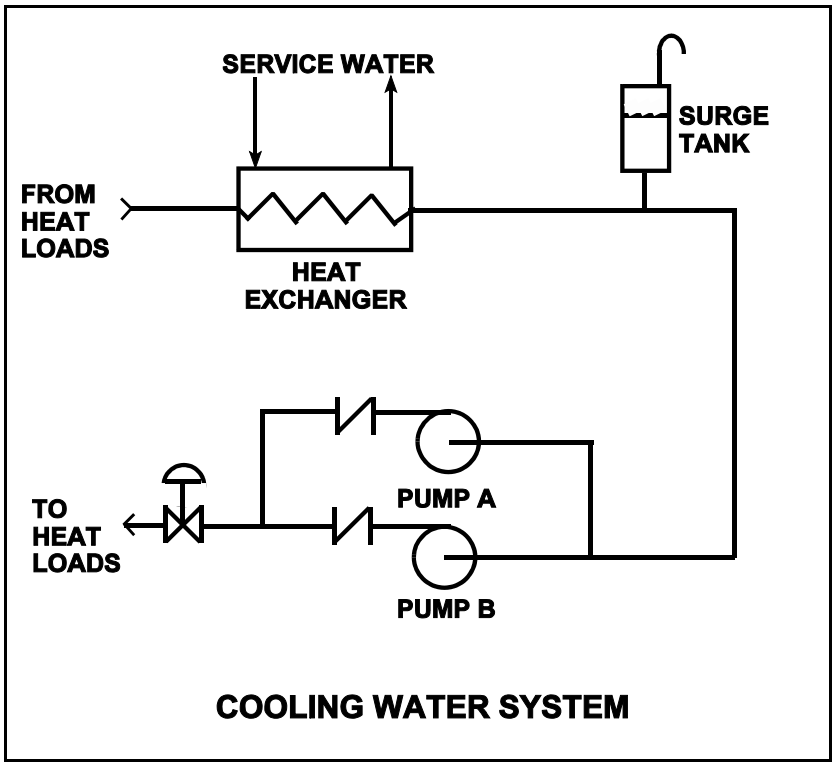
If pump A is cavitating, which one of the following will reduce or eliminate cavitation in pump A?

A. Starting pump B.

B. Positioning the discharge valve to 75% open.

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

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



QUESTION: 43

A four-loop nuclear power plant uses four identical reactor coolant pumps (RCPs) to supply reactor coolant flow through the reactor vessel. The plant is currently operating at 20% power with all RCPs in operation.

Which one of the following describes the stable RCS flow rate through the reactor vessel following the trip of one RCP? (Assume that no operator actions are taken and the reactor does not trip.)

A. Less than 75% of the original flow rate.

B. Exactly 75% of the original flow rate.

C. Greater than 75% of the original flow rate.

D. Unpredictable without pump curves for the RCPs.

QUESTION: 44

During a loss-of-coolant accident, which one of the following heat transfer mechanisms provides the most core cooling when fuel elements are not in contact with the coolant?

A. Radiation

B. Emission

C. Convection

D. Conduction

QUESTION: 45

Subcooled nucleate boiling is occurring along a heated surface. If the heat flux is increased slightly, what will be the effect on the ΔT between the surface and the fluid? (Assume subcooled nucleate boiling is still occurring.)

A. Small increase in ΔT because of steam blanketing.

B. Large increase in ΔT because of steam blanketing.

C. Small increase in ΔT as vapor bubbles form and collapse.

D. Large increase in ΔT causing radiative heat transfer to become significant.

QUESTION: 46

A nuclear reactor is operating at 100% steady-state power at the end of core life with all control rods fully withdrawn. At what axial location in a typical fuel assembly will the minimum departure from nucleate boiling ratio occur?

A. At the bottom of the fuel assembly

B. At the top of the fuel assembly

C. Between the bottom and the midplane of the fuel assembly

D. Between the midplane and the top of the fuel assembly

QUESTION: 47

Assume that a 30EF subcooling margin is maintained in the reactor coolant system (RCS) hot legs during each of the following shutdown reactor cooldown operations. Which one of the following will maintain the greatest subcooling margin in the reactor vessel head?

A. Performing a 25EF/Hr RCS cooldown on natural circulation using one steam generator.

B. Performing a 25EF/Hr RCS cooldown with all reactor coolant pumps running.

C. Performing a 100EF/Hr RCS cooldown on natural circulation using all steam generators.

D. Performing a 100EF/Hr RCS cooldown with one reactor coolant pump running.

QUESTION: 48

A nuclear reactor is shut down with natural circulation core cooling. Decay heat generation is equivalent to 1.0% rated thermal power. Stable natural circulation mass flow rate is 1,000 gpm.

When decay heat generation decreases to 0.5% rated thermal power, stable natural circulation flow rate will be approximately...

A. 125 gpm.

B. 250 gpm.

C. 707 gpm.

D. 794 gpm.

QUESTION: 49

Which one of the following describes the basis for the 2,200EF maximum fuel clad temperature limit?

A. 2,200EF is approximately 500EF below the fuel clad melting temperature.

B. The rate of the zircaloy-steam reaction increases significantly above 2,200EF.

C. If fuel clad temperature reaches 2,200EF, the onset of transition boiling is imminent.

D. The differential expansion between the fuel pellets and the fuel clad becomes excessive above 2,200EF.

QUESTION: 50

Brittle fracture of the reactor coolant system pressure boundary is <u>least likely</u> to occur at...

A. 120EF and 2,200 psig.

B. 120EF and 400 psig.

C. 400EF and 2,200 psig.

D. 400EF and 400 psig.

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

JUNE 2006 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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