UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
SEPTEMBER 2009 -- 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 materials will be collected 3.0 hours after the examination begins. This examination applies to a typical U.S. pressurized water reactor (PWR) nuclear power plant.

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

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

_____
Applicant's Signature

RULES AND INSTRUCTIONS FOR THE NRC
GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

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

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

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

2. Fill in your individual docket number.

3. Fill in the name of your facility.

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

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

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

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

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

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

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

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

With the PDP still running, the relief valve will be _____ open; and the safety valve will be discharging an average flow rate of _____.

A. partially; 6 gpm

B. partially; 2 gpm

C. fully; 6 gpm

D. fully; 2 gpm

QUESTION: 2

Refer to the drawing of four air-operated valves (see figure below). **Note:** The valve actuators may be shown with or without air pressure applied.

Given:

- The direction of system flow is from left to right when the valves are open.
- The internal components for each valve are identical except for the orientation of the valve disk and seat.
- The valve actuators exert the same force on the attached valve stem for a given applied air pressure.

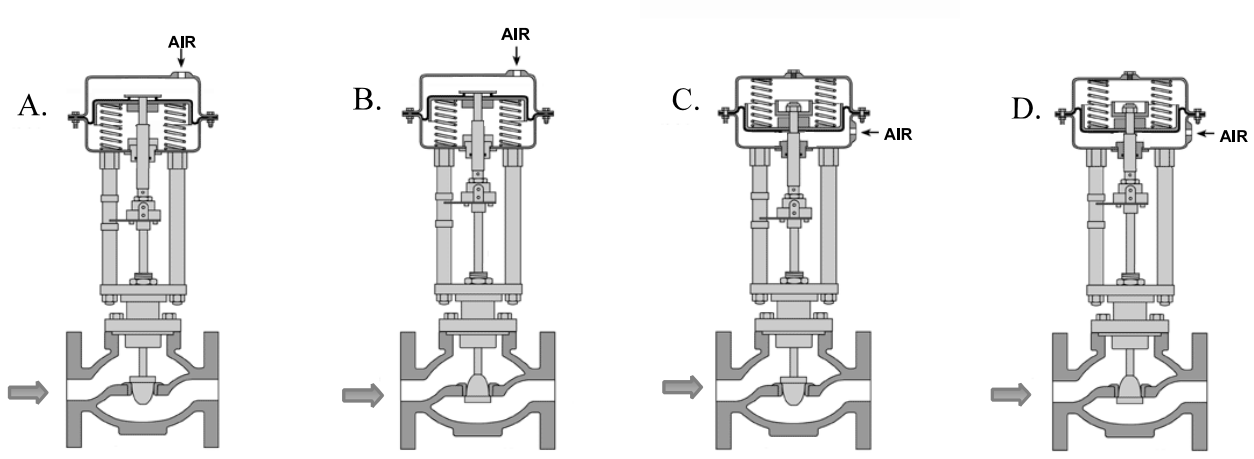
If each actuator is vented, which valve disk will remain closed with the most force?

A. A.

B. B.

C. C.

D. D.



QUESTION: 3

Consider water flowing through a frictionless venturi with no heat gain or loss.

For the above system, flow rate through the venturi is proportional to the square root of differential pressure. For steam flow, the relationship must be modified to account for changes in steam _____ as it flows through the venturi.

A. velocity

B. enthalpy

C. internal energy

D. specific volume

QUESTION: 4

Refer to the drawing of a tank differential pressure (D/P) level detection system (see figure below).

The D/P level detector was just calibrated and returned to operation with the following conditions:

- The reference leg contains 20 feet of water at 70°F.
- The tank contains 18 feet of water at 70°F.
- Tank level indication is 18 feet.

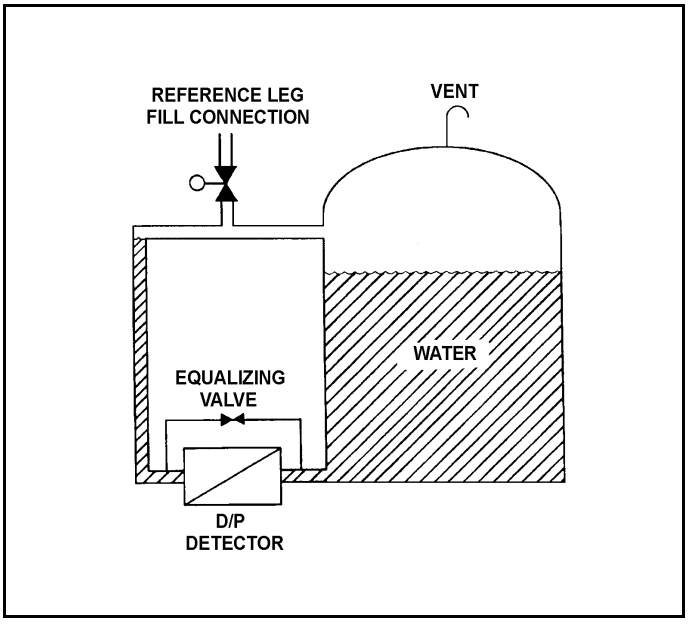
Assume the actual tank water level, and the temperature of the water in the tank and reference leg do not change. Which one of the following will be the new tank level indication if the reference leg water level decreases to 18 feet?

A. 22 feet

B. 20 feet

C. 18 feet

D. 2 feet



QUESTION: 5

Refer to the simplified drawing of a control rod position detector circuit (see figure below).

A magnet on the control rod extension (or drive) shaft sequentially closes individual reed switches mounted vertically adjacent to the control rod drive housing. A constant +5 dc volts is supplied to the input of the resistor network at resistor R_1.

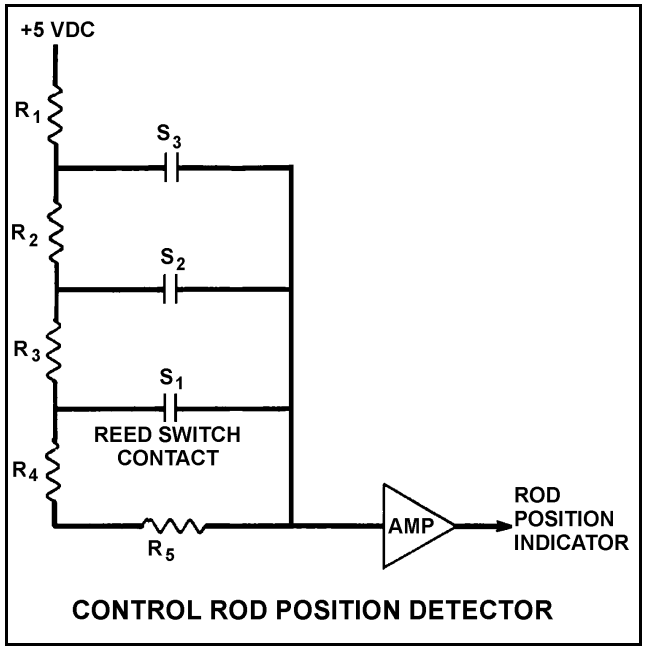
A control rod is initially fully inserted such that all reed switch contacts are open; then the rod is withdrawn until reed switch contact S_1 is closed. Compared to the initial circuit currents, the current through resistor R_5 after the rod withdrawal will be _____, and the output current of the resistor network to the amplifier will be _____.

A. lower, higher

B. lower, lower

C. higher, higher

D. higher, lower



CONTROL ROD POSITION DETECTOR

QUESTION: 6

Just prior to a nuclear power plant outage, the power range nuclear instrumentation was calibrated at 50 percent reactor power. During the outage, 25 percent of the fuel assemblies were shuffled to reduce the power being produced at the center of the core. No fuel assemblies were replaced.

Immediately after the outage, how will reactor power indication compare to actual reactor power when the reactor is stabilized at 50 percent power?

A. Indication will be higher than actual power due to increased neutron leakage.

B. Indication will be higher than actual power due to decreased neutron leakage.

C. Indication will be lower than actual power due to decreased neutron leakage.

D. Indication will be lower than actual power due to increased neutron leakage.

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 decreased, 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

A diesel generator is supplying an isolated electrical bus with the governor operating in the isochronous mode. If a large electrical bus load trips, generator frequency will...

A. initially increase, then decrease and stabilize below the initial value.

B. initially increase, then decrease and stabilize at the initial value.

C. initially increase, then decrease and stabilize above the initial value.

D. remain constant during and after the load trip.

QUESTION: 9

Refer to the drawing of a water storage tank with a level control system (see figure below). The tank water level is being automatically controlled at 50% by a proportional-integral (PI) controller that positions the drain valve. Tank water level is currently stable with 500 gpm entering the tank and the drain valve 50% open.

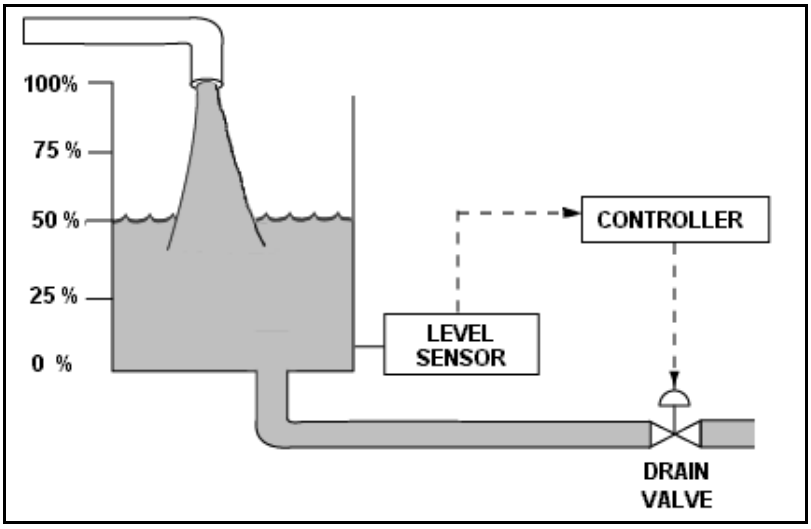
The tank suddenly develops a constant 200 gpm leak, while the input flow rate remains constant at 500 gpm. When tank water level stabilizes, level will be _____, and the drain valve position will be _____.

A. 50%; more open

B. 50%; more closed

C. lower than 50%; more open

D. lower than 50%; more closed



QUESTION: 10

Which one of the following is an effective method for ensuring that a centrifugal pump remains primed and does not become gas bound during operation and after shutdown?

A. Install the pump below the level of the suction supply.

B. Install a check valve in the discharge piping of the pump.

C. Install an orifice plate in the discharge piping of the pump.

D. Install a pump recirculation line from the pump discharge piping to the pump supply piping.

QUESTION: 11

A centrifugal pump is needed to take suction on a water storage tank and deliver high pressure water to a water spray system. To minimize axial thrust on the pump shaft, the pump should have _____ stage(s); and to maximize the available NPSH at the impeller inlet, the pump should have a _____ suction impeller.

A. a single; single

B. a single; double

C. multiple opposed; single

D. multiple opposed; double

QUESTION: 12

Some large centrifugal pumps are started with their discharge valves closed to prevent...

A. cavitation in the pump.

B. lifting the discharge relief valve.

C. loss of recirculation (miniflow).

D. excessive current in the pump motor.

QUESTION: 13

The minimum required net positive suction head for a typical positive displacement pump will increase the most if the pump...

A. motor speed increases from 1,200 rpm to 1,600 rpm.

B. discharge pressure decreases from 100 psig to 50 psig.

C. suction temperature increases from 75°F to 85°F.

D. discharge valve is positioned from 90% open to fully open.

QUESTION: 14

A main generator is operating normally and 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 normal adjustments to the main generator voltage regulator and speed control setpoints such that each adjustment will cause the main generator to operate at a power factor closer to 1.0. (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

The starting current in a typical ac induction motor is typically much higher than the full-load running current because...

A. starting torque is lower than full-load running torque.

B. starting torque is higher than full-load running torque.

C. rotor speed during start is too low to generate significant counter electromotive force in the stator.

D. rotor current during start is too low to generate significant counter electromotive force in the stator.

QUESTION: 16

A counter-flow heat exchanger is being used to cool the lube oil system for a main turbine and generator.

The main turbine and generator was initially operating at 100 percent load with the following stable heat exchanger conditions:

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

Main turbine and generator load was reduced, and the heat exchanger cooling water mass flow rate was decreased to one-half of its initial value, resulting in the following stable current conditions:

$T_{oil\ in}$ = 178°F
$T_{oil\ out}$ = 138°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = ?

Assume that the lube oil mass flow rate and the specific heats of both fluids did not change.

Which one of the following is the current cooling water outlet temperature?

A. 115°F

B. 125°F

C. 135°F

D. 145°F

QUESTION: 17

A nuclear power plant is operating normally at 50% of rated power. Which one of the following will result from a cooling water tube rupture in the main condenser?

A. Increased condenser vacuum.

B. Increased conductivity of the condensate.

C. Decreased condensate pump available net positive suction head.

D. Decreased condensate pump flow rate.

QUESTION: 18

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

A. Condensate

B. Oily water

C. Radioactive water

D. Makeup water

QUESTION: 19

A result of proper demineralizer operation on water with ionic impurities is that the exiting water will always have a...

A. higher pH.

B. lower pH.

C. higher conductivity.

D. lower conductivity.

QUESTION: 20

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

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

A. motoring of the generator due to unequal frequencies.

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

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

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

QUESTION: 21

The function of high voltage electrical disconnects is to provide_____ electrical isolation of equipment during _____ conditions.

A. manual; no-load

B. manual; overload

C. automatic; no-load

D. automatic; overload

QUESTION: 22

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.
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: 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

A nuclear power plant is operating at 100% power with rod control in Manual. If no operator action is taken, then during the next two weeks of steady-state operation at 100% power, shutdown margin will...

A. continuously increase.

B. continuously decrease.

C. initially increase, then return to the same value.

D. initially decrease, then return to the same value.

QUESTION: 25

During a nuclear reactor startup, reactor power increases from $3x10^{-6}$% to $5x10^{-6}$% in 2 minutes with no operator action. Which one of the following was the average reactor period during the power increase?

A. 357 seconds

B. 235 seconds

C. 155 seconds

D. 61 seconds

QUESTION: 26

When compared to the beginning of a fuel cycle, the moderator temperature coefficient at 100 percent power near the end of a fuel cycle (EOC) is...

A. more negative, because fewer boron-10 nuclei are removed from the core for a given moderator temperature increase.

B. less negative, because more boron-10 nuclei are removed from the core for a given moderator temperature increase.

C. more negative, because a smaller fraction of the neutron flux will leak out of the core following a given moderator temperature increase.

D. less negative, because a larger fraction of the neutron flux will leak out of the core following a given moderator temperature increase.

QUESTION: 27

Neglecting the effects of core Xe-135, which one of the following power changes requires the smallest amount of positive reactivity addition?

A. 2% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 50% power

QUESTION: 28

A nuclear reactor is operating at steady state 70% power with the following conditions:

RCS boron concentration:	600 ppm
Control rod position:	110 inches
RCS average temperature:	575 °F

Reactor power is increased to 100% over the next four hours. The 100% reactor power conditions are as follows:

RCS boron concentration:	590 ppm
Control rod position:	130 inches
RCS average temperature:	580 °F

Given the following reactivity coefficient/worth values, and neglecting fission product poison reactivity changes, what is the differential control rod worth?

Power coefficient:	-0.3% ΔK/K/%
Moderator temperature coefficient:	-0.2% ΔK/K/°F
Differential boron worth:	-0.1% ΔK/K/ppm

A. 0.2% ΔK/K/inch

B. 0.25% ΔK/K/inch

C. 0.4% ΔK/K/inch

D. 0.5% ΔK/K/inch

QUESTION: 29

As moderator temperature increases, the differential rod worth becomes more negative because...

A. decreased moderator density causes more neutron leakage out of the core.

B. moderator temperature coefficient decreases, causing decrease competition.

C. fuel temperature increases, decreasing neutron absorption in fuel.

D. decreased moderator density increases neutron migration length.

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 power plant is initially operating at equilibrium 100% power in the middle of a fuel cycle. The operators decrease main generator load while adding boric acid to the reactor coolant system (RCS) over a period of 30 minutes. At the end of this time period, reactor power is 70% and average reactor coolant temperature is 575°F. All control rods remain fully withdrawn and in manual control.

Given:

Total reactivity added by operator = -3.3×10^{-3} ΔK/K
Total power coefficient = -1.1×10^{-4} ΔK/K/% power

Assuming no additional RCS boration occurs and no other operator actions are taken, which one of the following describes the average reactor coolant temperature after an additional 60 minutes?

A. 575°F and stable.

B. Less than 575°F and increasing.

C. Less than 575°F and decreasing.

D. Less than 575°F and stable.

QUESTION: 32

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

A. Provide neutron flux shaping.

B. Provide more uniform power density.

C. Offset the effects of control rod burnout.

D. Allow higher fuel enrichment of initial core load.

QUESTION; 33

A subcritical nuclear reactor has an initial source range count rate of 2.0×10^5 cps with a core K_{eff} of 0.98. Positive reactivity is added to the core until a stable count rate of 5.0×10^5 cps is achieved. What is the new K_{eff}?

A. 0.984

B. 0.988

C. 0.992

D. 0.996

QUESTION: 34

Near the end of a fuel cycle, a nuclear reactor required three hours to increase power from 70 percent to 100 percent using only reactor coolant system (RCS) boron dilution at the maximum rate to control RCS temperature.

Following a refueling outage, the same reactor power change performed under the same conditions will require a _____ period of time because the rate at which RCS boron concentration can be decreased is _____.

A. longer; slower

B. shorter; slower

C. longer; faster

D. shorter; faster

QUESTION: 35

Nuclear reactors A and B are identical and have been operated at 100% power for six months when a reactor trip occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

Which reactor, if any, will have the longest reactor period five minutes after the trip?

A. Reactor A due to the greater shutdown reactivity.

B. Reactor B due to the smaller shutdown reactivity.

C. Both reactors will have the same reactor period because, after five minutes, both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same reactor period because, after five minutes, only the longest-lived delayed neutron precursors will be releasing fission neutrons.

QUESTION: 36

A nuclear power plant has been operating for one hour at 50% of rated power following six months of operation at steady-state 100% power. What percentage of rated thermal power is currently being generated by reactor decay heat?

A. 1% to 2%

B. 3% to 5%

C. 6% to 8%

D. 9% to 11%

QUESTION: 37

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

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. A ventilation malfunction causes containment structure pressure to decrease to 13 psia.

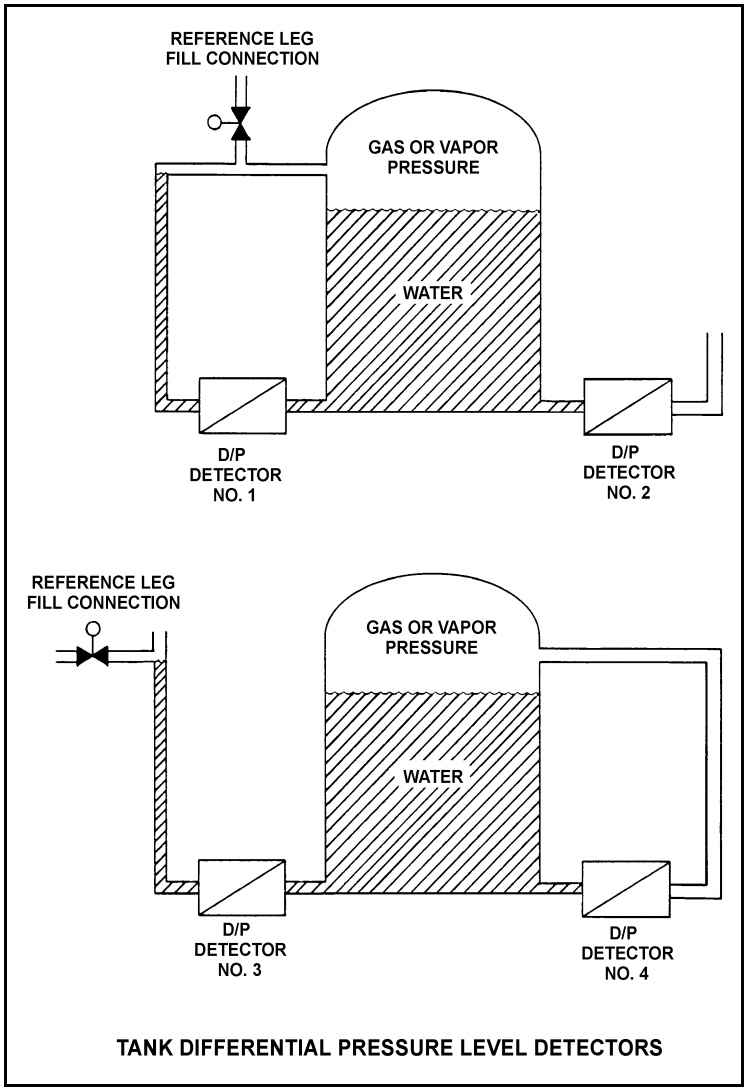
Which level detectors will produce the highest indication?

A. 1 and 2

B. 3 and 4

C. 1 and 4

D. 2 and 3



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

QUESTION: 38

Consider a pressurizer containing a saturated water/steam mixture at 636°F with a quality of 50%. If an outsurge removes 10% of the liquid volume from the pressurizer, 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

Water enters a positive displacement pump at 50 psig and 90°F. What is the available net positive suction head for the pump?

A. 80 feet

B. 114 feet

C. 133 feet

D. 148 feet

QUESTION: 40

A nuclear power plant is operating with the following main steam parameters at a main turbine steam inlet valve:

Pressure: 900 psia
Quality: 99%

The main turbine steam chest pressure is 300 psia. Which one of the following is the quality of the steam in the steam chest?

A. 100%

B. 98%

C. 88%

D. 87%

QUESTION: 41

A nuclear power plant is initially operating at 85% reactor power when extraction steam to a high-pressure feedwater heater is isolated. Main generator load is returned to its initial value. When the plant stabilizes, reactor power will be _____ than 85%, and overall plant thermal efficiency will be _____.

A. greater; lower

B. greater; higher

C. less; lower

D. less; higher

QUESTION: 42

A nuclear power plant is recovering from a loss of offsite power that caused all reactor coolant pumps (RCPs) to stop. Pressurizer level indication is off-scale high.

Which one of the following is most likely to occur if the steam generator (S/G) temperatures are 50°F higher than their associated reactor coolant system (RCS) loop temperatures when an RCP is restarted?

A. Localized water hammer in the RCS.

B. Pressurized thermal shock to the S/Gs.

C. A large pressure spike throughout the RCS.

D. Inadvertent lifting of a S/G atmospheric relief valve.

QUESTION: 43

A plant shutdown will be performed because of leakage from the main condenser cooling water system into the main condenser through a tube leak.

Given the following initial conditions:

- Main condenser pressure is 1.7 psia.
- Atmospheric pressure is 14.7 psia
- Main condenser cooling water pressure at the location of the tube leak is 18 psig.
- Cooling water leak rate into the main condenser is 80 gpm.

If the main condenser is brought to atmospheric pressure, with no changes to the main condenser cooling water system parameters, what will be the rate of cooling water leakage into the main condenser?

A. 36 gpm

B. 52 gpm

C. 61 gpm

D. 72 gpm

QUESTION: 44

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

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

QUESTION: 45

Refer to the drawing of a pool boiling curve (see figure below).

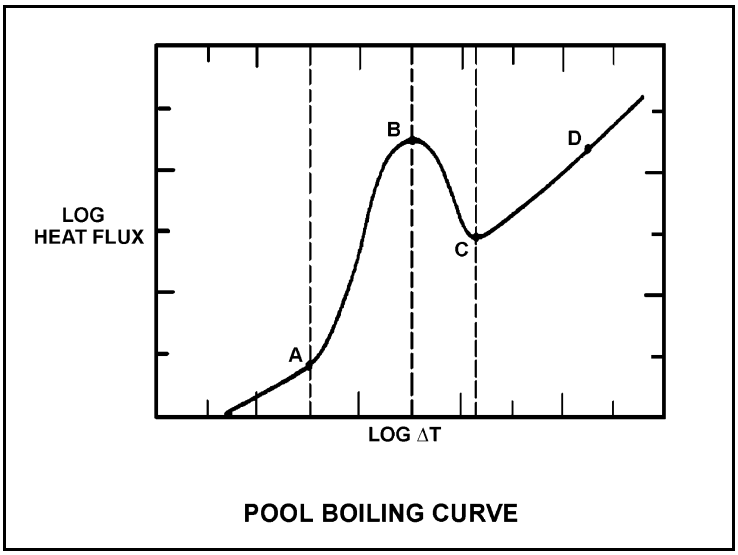
Which one of the points shown marks the smallest ΔT at which stable film boiling can exist?

A. A

B. B

C. C

D. D



QUESTION: 46

Increasing coolant flow rate through a nuclear reactor core improves heat transfer from the fuel because it _____ the laminar film thickness and _____ the temperature of the coolant adjacent to the fuel.

A. increases; raises

B. increases; lowers

C. decreases; raises

D. decreases; lowers

QUESTION: 47

A 60°F/hour reactor coolant system (RCS) cooldown and depressurization with natural circulation is in progress. After one hour, RCS subcooling will be minimum in the...

A. reactor vessel head.

B. RCS loop hot leg.

C. RCS loop cold leg.

D. reactor core.

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

Given the following initial core parameters for a segment of a fuel rod:

Power density = 3 kW/ft
$T_{coolant}$ = 579°F
$T_{fuel\ centerline}$ = 2,400°F

Reactor power is increased such that the following core parameters now exist for the same fuel rod segment:

Power density = 5 kW/ft
$T_{coolant}$ = 590°F
$T_{fuel\ centerline}$ = ?

Assuming no boiling occurs and coolant flow rate is unchanged, what will be the new stable $T_{fuel\ centerline}$?

A. 3,035°F

B. 3,614°F

C. 3,625°F

D. 4,590°F

QUESTION: 50

Which one of the following describes the thermal stress placed on the reactor vessel during a cooldown of the reactor coolant system?

A. Tensile across the entire wall.

B. Compressive across the entire wall.

C. Tensile at the inner wall, compressive at the outer wall.

D. Compressive at the inner wall, tensile at the outer wall.

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

SEPTEMBER 2009 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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