JUL 19 1990

Docket No. 50-458

Gulf States Utilities
ATTN: James C. Deddens
Senior Vice President (RBNG)
P. O. Box 220
St. Francisville, LA 70775

Gentlemen:

On June 6, 1990, the NRC administered the Generic Fundamentals Examination Section (GFES) of the written operator licensing examination to an employee of your facility. Enclosed with this letter provided to your training department is a copy of the examination (including the answer key), the grading results for your facility, and a copy of the individual answer sheet for the examinee from your facility. Your training department is requested to forward the results and the answer sheet to the examinee.

In accordance with 10 CFR 2.790 of the Commission's Regulations, a copy of this letter and Enclosure 1 will be placed in the NRC's Public Document Room (PDR). The results for individual examinees are exempt from disclosure; therefore, Enclosures 2 and 3 will not be placed in the PDR.

Questions concerning this examination should be directed to Mr. Paul Doyle at (301) 492-1047.

Sincerely,
Original Signed By:
Samuel J. Collins

Samuel J. Collins, Director
Division of Reactor Projects

Enclosures: As stated

cc:
Gulf States Utilities
ATTN: Dale Andrews, Nuclear Training
Director
P.O. Box 220
St. Francisville, LA 70775

DRS:OLS:LA	DRS:OLS:SC	DRS:DivDir	DRP:DivDir
EMHimes	JLPellet	LJCallan	SJCollins
7/18/90	7/18/90	7/19/90	7/19/90

IE42
11

bcc w/Enclosure 1:
DMB (IE42)
PDR w/Encl 1

bcc distribution by RIV:
R. D. Martin
MIS System
J. L. Pellet
E. M. Himes
NRR Project Manager
DRP SC
RIV file
L. Miller, TTC
DRS (J. Pellet rdg file)

UNITED STATES NUCLEAR REGULATORY COMMISSION
BOILING WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 1990 - FORM B

Please Print

Name: _____

Facility: _____

ID Number: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO CANDIDATE

Use the answer sheet provided. Each question has equal point value. A score of at least 80% is required to pass this portion of the written licensing examination. All examination papers will be collected 2.5 hours after the examination starts.

SECTION	QUESTIONS	% OF TOTAL	SCORE
REACTOR THEORY	1 - 28		
THERMODYNAMICS	29 - 56		
COMPONENTS	57 - 100		
TOTALS	100		

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

_____

Candidate's Signature

RULES AND GUIDELINES FOR THE GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

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

(2) Fill in the name of your facility.

(3) Fill in the ID-Number you were given at registration.

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

(5) Three handouts are provided for your use during the examination, an Equations and Conversions sheet, instructions for filling out the answer sheet, and Steam Table booklets.

(6) Use only 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) Any questions about an item on the examination should be directed to the examiner only.

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

(10) 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.

(11) After you have completed the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or been given any assistance in completing the examination.

(12) Turn in your examination materials, answer sheet on top, followed by the exam booklet, then examination aids - steam table booklets, handouts and scrap paper used during the examination.

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

EQUATION SHEET

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

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

$Q = UA \Delta T$

$SUR = 26.06/\tau$

$SUR = \dfrac{26.06 (\lambda_{eff} \rho)}{(\beta - \rho)}$

$P = P_0 10^{SUR(t)}$

$P = P_0 e^{(t/\tau)}$

$\tau = (\ell^*/\rho) + [(\bar{\beta} - \rho)/\lambda_{eff}\rho]$

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

$\rho = \Delta K_{eff}/K_{eff}$

$$\text{Cycle Efficiency} = \frac{\text{Net Work (out)}}{\text{Energy (in)}}$$

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

$CR_1 (1 - K_{eff})_1 = CR_2 (1 - K_{eff})_2$

$M = 1/(1 - K_{eff}) = CR_1/CR_0$

$M = \dfrac{(1 - K_{eff})_0}{(1 - K_{eff})_1}$

$SDM = (1 - K_{eff})/K_{eff}$

$Pwr = W_t \dot{m}$

$\tau = \ell^*/(\rho - \bar{\beta})$

$\ell^* = 1 \times 10^{-5}$ seconds

$\lambda_{eff} = 0.1$ seconds^{-1}

$$\nu(P_0 - P_1) + 1/2 (\vec{v}_0^{\,2} - \vec{v}_1^{\,2}) + g(z_0 - z_1) = 0$$

---

1 Curie = 3.7×10^{10} dps

1 hp = 2.54×10^3 BTU/hr

1 BTU = 778 ft-lbf

°C = 5/9 (°F - 32)

1 kg = 2.21 lbm

1 Mw = 3.41×10^6 BTU/hr

°F = 9/5 °C + 32

QUESTION: 1

A neutron which possesses the same kinetic energy as its surroundings is called a/an _____ neutron.

A. slow

B. intermediate

C. fast

D. thermal

QUESTION: 2

The best neutron moderator is:

A. dense and is composed of large atoms.

B. not dense and is composed of large atoms.

C. dense and is composed of small atoms.

D. not dense and is composed of small atoms.

QUESTION: 3

Which of the following conditions describes a reactor that is EXACTLY critical?

A. Keff = 1; delta-K/K = 0

B. Keff = 1; delta-K/K = 1

C Keff = 0; delta-K/K = 0

D. Keff = 0; delta-K/K = 1

QUESTION: 4

Which of the following, if changed, will have a direct effect on Keff?

1. Fuel enrichment
2. Control rod worth
3. Neutron contribution from neutron sources
4. Shutdown margin when the reactor is subcritical

A. 1, 2, 3

B. 1, 2, 4

C. 1, 3, 4

D. 2, 3, 4

QUESTION: 5

Of the following conditions, which group is necessary for subcritical multiplication to occur?

A. Neutron source, moderator, and fissionable material.

B. Moderator, neutron source, and Keff greater than one.

C. Keff greater than one, moderator, and fissionable material.

D. Fissionable material, moderator, and Keff greater than one.

QUESTION: 6

Which one of the following statements is a characteristic of subcritical multiplication?

A. The subcritical neutron level is directly proportional to the neutron source strength.

B. Doubling the indicated count rate by reactivity additions will reduce the margin to criticality by approximately one quarter.

C. For equal reactivity additions, it takes less time for the new equilibrium source range count rate to be reached as Keff approaches unity.

D. An incremental withdrawal of any given control rod will produce an equivalent equilibrium count rate increase, whether Keff is 0.88 or 0.92.

QUESTION: 7

How does the effective delayed neutron fraction vary over core life?

A. Increases due to the burnup of U-238.

B. Decreases due to the buildup of Pu-239.

C. Increases due to the buildup of Pu-239.

D. Decreases due to the burnup of U-238.

QUESTION: 8

Reactor power is increased from 50 kW to 370 kW in two minutes. Select the doubling time.

A. 42 seconds

B. 60 seconds

C. 86 seconds

D. 120 seconds

QUESTION: 9

The fuel temperature coefficient of reactivity will become LESS NEGATIVE following a/an:

A. increase in core age from BOC to EOC.

B. fuel temperature decrease.

C. void fraction increase.

D. moderator temperature increase.

QUESTION: 10

Which of the following is the PRIMARY reason the void coefficient becomes LESS NEGATIVE with core burnup?

A. The increase in the thermal neutron flux

B. The decrease in the thermal diffusion length

C. The increase in the fuel centerline temperature

D. The decrease in the control rod density

QUESTION: 11

The plant is being returned to operation following a refueling outage. Most of the positive reactivity added by the operator during the reactor power increase from 10 percent power to full power is required to overcome the negative reactivity from:

A. fuel temperature increase.

B. xenon buildup.

C. moderator temperature increase.

D. void fraction increase.

QUESTION: 12

The reactor is exactly critical below the point of adding heat. A control rod is manually inserted for 5 seconds. Reactor power will:

A. decrease to a shutdown power level low in the source (startup) range.

B. decrease temporarily, then return to the original value due to the resulting decrease in moderator temperature.

C. decrease until inherent positive reactivity feedback causes the reactor to become critical at a lower neutron level.

D. decrease temporarily, then return to the original value due to subcritical multiplication.

QUESTION: 13

If the void fraction surrounding a control rod increases, the worth of that control rod will:

A. decrease, because more neutrons leak out of the core.

B. increase, because neutrons will travel farther resulting in a larger fraction of fission neutrons being absorbed by the control rod.

C. decrease, because more neutrons are resonantly absorbed in the fuel as they are being thermalized.

D. increase, because control rods are epithermal neutron absorbers and neutrons remain at higher energies longer.

QUESTION: 14

If a control rod is fully inserted (from the fully withdrawn position), the axial flux shape will undergo a:

A. minor distortion, because the fully inserted control rod appears to be invisible.

B. minor distortion, because the fully inserted control rod is an axially uniform poison.

C. major distortion, because the upper and lower core halves are loosely coupled.

D. major distortion, because power production along the length of the rod drastically decreases.

QUESTION: 15

Xenon-135 is removed from an operating reactor by neutron capture and radioactive decay to:

A. Iodine-135.

B. Lanthanum-135.

C. Tellurium-135.

D. Cesium-135.

QUESTION: 16

A reactor has been operating at 50 percent power for one week when power is ramped in four hours to 100 percent power. Which statement best describes the new equilibrium xenon concentration?

A. The new xenon equilibrium value will be twice the 50 percent value.

B. The new xenon equilibrium value will be less than twice the 50 percent value.

C. The new xenon equilibrium value will be more than twice the 50 percent value.

D. The xenon equilibrium value will remain the same since it is independent of power.

QUESTION: 17

A reactor that has been operating at 100 percent power for about two weeks has power reduced to 50 percent in one hour. To compensate for the change in Xenon-135 during the next four hours, the operator must add:

A. negative reactivity to compensate for Xenon building in.

B. negative reactivity because Xenon is rapidly decaying away.

C. positive reactivity to compensate for Xenon building in.

D. positive reactivity because Xenon is rapidly decaying away.

QUESTION: 18

Xenon-135 is produced in the reactor by two methods. One is directly from fission, the other is indirectly from the decay of:

A. Xenon-136.

B. Iodine-135.

C. Cesium-135.

D. Barium-135.

QUESTION: 19

The reactor is initially shutdown with no xenon in the core. The reactor is brought critical and four hours later is in the middle of the intermediate range monitor, range 8. The maintenance department has asked that power be maintained constant at this level for approximately 12 hours. To accomplish this, rods will have to be:

A. pulled slowly for four to six hours, then inserted slowly.

B. inserted slowly for four to six hours, then pulled slowly.

C. inserted slowly for the duration of the 12 hours.

D. pulled slowly for the duration of the 12 hours.

QUESTION: 20

Which of the following lists the reasons for using burnable poisons in an operating reactor.

1. Provide more uniform power density.
2. Counteract the effects of control rod burnout.
3. Allow higher fuel enrichment of initial core load.
4. Provide neutron flux shaping.

A. 1, 2, 3

B. 1, 2, 4

C. 1, 3, 4

D. 2, 3, 4

QUESTION: 21

Which one of the following statements describes count rate characteristics after a 5 second control rod withdrawal with the reactor very close to criticality? Assume the reactor remains subcritical.

A. The count rate will rapidly increase (prompt jump) then gradually increase to a stable value.

B. The count rate will rapidly increase (prompt jump) then gradually decrease to the previous value.

C. The count rate will rapidly increase (prompt jump) to a stable value.

D. There will be no change in count rate until criticality is achieved.

QUESTION: 22

During a reactor startup, source range monitors (SRMs) indicate 100 CPS, and Keff is 0.95. After a number of rods have been withdrawn, SRMs indicate 270 CPS. Which one of the following is the new Keff? (Assume reactor period is infinity before and after the rod withdrawal.)

A. 0.936

B. 0.971

C. 0.982

D. 0.990

QUESTION: 23

During a 10 percent load increase from 20 percent power by control rod withdrawal, which one of the following statements BEST describes the change in void fraction?

A. Void fraction increases.

B. Void fraction decreases.

C. Void fraction initially increases, then decreases back to the original value.

D. Void fraction initially decreases, then increases back to the original value.

QUESTION: 24

What is the purpose of a rod sequence exchange?

A. Ensures proper rod coupling.

B. Prevents rod shadowing.

C. Promotes even fuel burnout.

D. Minimizes water hole peaking.

QUESTION: 25

Shortly after a reactor trip, reactor power indicates 0.5 percent where a stable negative period is attained. Reactor power will be reduced to 0.05 percent in approximately _____ seconds.

A. 90

B. 180

C. 270

D. 360

QUESTION: 26

The PRIMARY source of heat production with the reactor plant in Hot Standby one week after a reactor trip from 100 percent equilibrium power is:

A. reactor recirculation pumps.

B. fission of activated U-235 and Pu-239.

C. spontaneous fission.

D. fission product decay.

QUESTION: 27

At the end of core life, the majority of power is generated by fission of which of the following two isotopes?

A. Pu-239 and U-235

B. Pu-239 and U-238

C. Pu-241 and U-238

D. U-235 and U-238

QUESTION: 28

After one month of operation at 100 percent reactor power, _____ of the thermal power produced by the reactor comes from the decay of fission products.

A. greater than 10 percent

B. greater than 5 percent but less than 10 percent

C. greater than 1 percent but less than 5 percent

D. less than 1 percent

QUESTION: 29

An enclosed water storage tank has its upper volume pressurized with nitrogen to prevent oxygen absorption. A differential pressure detector with a dry reference leg is used to measure the tank level. For this type of level detector, the greatest accuracy will be achieved if the low pressure side of the detector is connected to:

A. the nitrogen volume at the top of the tank.

B. a dry reference leg open to atmosphere.

C. a sealed dry reference leg external to the tank.

D. the bottom of the tank.

QUESTION: 30

A pressure gauge on a condenser reads 27 inches of Mercury (Hg) vacuum. What is the absolute pressure corresponding to this vacuum? (Assume an atmospheric pressure of 15 psia.)

A. 1.0 psia

B. 1.5 psia

C. 3.0 psia

D. 15.0 psia

QUESTION: 31

Turbine "X" has 250 psia saturated steam at its entrance. Turbine "Y" has 250 psia, 500 degree F superheated steam at its entrance. Both turbines are 80 percent efficient and exhaust to a 1 psia condenser. Calculate the percentage of moisture at the exhaust of turbines X and Y.

A. Turbine X = 17.7 percent; turbine Y = 13.6 percent

B. Turbine X = 17.7 percent; turbine Y = 20.8 percent

C. Turbine X = 24.5 percent; turbine Y = 13.6 percent

D. Turbine X = 24.5 percent; turbine Y = 20.8 percent

QUESTION: 32

Refer to the figure below for the following question.

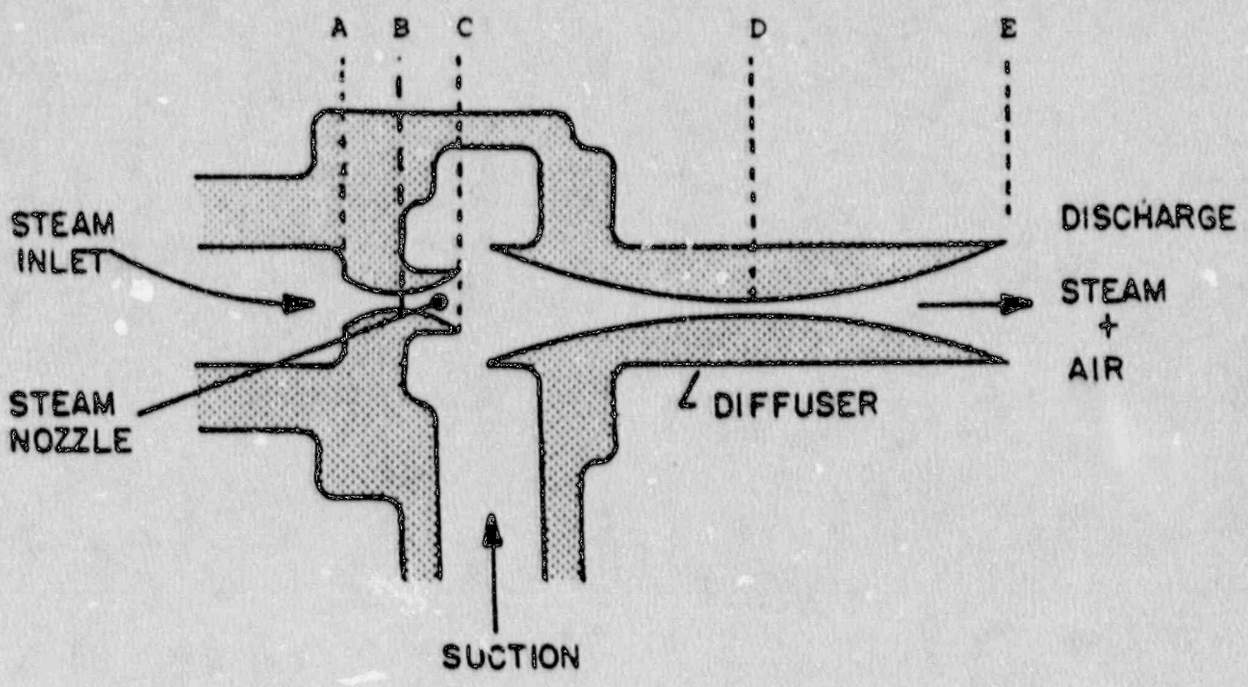
In the figure of an operating steam jet air ejector, steam flowing from C to D undergoes a pressure _____ and a velocity _____.

A. decrease; decrease

B. decrease; increase

C. increase; increase

D. increase; decrease


A
B
C
D
E
STEAM
INLET
STEAM
NOZZLE
DISCHARGE
STEAM
+
AIR
DIFFUSER
SUCTION

QUESTION: 33

The plant is operating at 100 percent power when the only in-service steam jet air ejector is inadvertently isolated from the main condenser. The operator verifies circulating water system parameters have not changed. If no operator action is taken over the next 10 minutes, condenser vacuum will:

A. slowly increase (lower absolute pressure).

B. slowly decrease and stabilize at a slightly lower vacuum (higher absolute pressure).

C. slowly and continuously decrease (higher absolute pressure) towards atmospheric pressure.

D. remain essentially the same (constant absolute pressure).

QUESTION: 34

Which of the following actions will DECREASE plant efficiency?

A. Reducing steam moisture content.

B. Reducing condensate depression.

C. Increasing turbine exhaust pressure.

D. Increasing temperature of feedwater entering the reactor vessel.

QUESTION: 35

Which one of the following statements describes the head loss in a 10 foot section of horizontal pipe of uniform diameter containing water flowing at 50 cubic feet per second?

A. Head loss is directly proportional to the volumetric flowrate.

B. Head loss is equal to the difference between the potential head at the beginning of the section and the potential head at the end of the section.

C. Head loss is equal to the difference between the velocity head at the center of the section and the velocity head at the end of the section.

D. Head loss is equal to the difference of the pressure head at the beginning of the section and the pressure head at the end of the section.

QUESTION: 36

The most serious concern with starting a feedwater pump with downstream fluid in a saturated condition is:

A. cavitation.

B. water hammer.

C. thermal shock.

D. positive reactivity addition.

QUESTION: 37

A single-suction radial-flow impeller experiences an imbalancing force because one side of the impeller is exposed to suction pressure, with the other side subjected to a greater discharge pressure.

What is this imbalancing force called?

A. Axial thrust

B. Radial thrust

C. Kingsbury thrust

D. Journal thrust

QUESTION: 38

Cooling water enters a fuel channel and exits with an enthalpy of 1195 BTU/lbm at a reactor pressure of 1050 psig. What is the state of the fluid at the exit of the fuel channel?

A. Saturated

B. Superheated

C. Compressed

D. Subcooled

QUESTION: 39

A cooling water system is operating at 100 psig when a leak of 85 gpm occurs. Which one of the following is closest to the leak rate expected when system pressure reaches 50 psig?

A. 30 gpm

B. 40 gpm

C. 50 gpm

D. 60 gpm

QUESTION: 40

What is the purpose of the coolant flow that bypasses the fuel assemblies and enters the core interstitial region?

A. Removes heat generated in the control rods and LPRMs.

B. Equalizes core D/P between the inlet and outlet plenums.

C. Minimizes effect of increased flow resistance due to two phase flow.

D. Reduces upward force exerted by incoming coolant on the fuel support piece.

QUESTION: 41

Which one of the following instrumentation systems MOST ACCURATELY indicates the mass flow rate through the reactor for calculation of core thermal power during reactor power operation?

A. Core flow

B. Steam flow

C. Feed flow

D. Recirculation loop flow

QUESTION: 42

The power range nuclear instruments have been adjusted to 100 percent based on a calculated calorimetric. Which one of the following will result in actual reactor power being LESS than indicated reactor power?

A. The feedwater temperature used in the calorimetric calculation was higher than actual feedwater temperature.

B. The reactor recirc pump heat input term was omitted from the calorimetric calculation.

C. The feed flow used in the calorimetric calculation was lower than actual feed flow.

D. The steam pressure used in the calorimetric calculation is lower than actual steam pressure.

QUESTION: 43

Which of the following conditions are necessary to sustain natural convection?

1. Condensate subcooling
2. Density difference
3. Energy storage
4. Conduction

A. 1, 2, 3

B. 1, 2, 4

C. 1, 3, 4

D. 2, 3, 4

QUESTION: 44

What type of boiling is described as follows: The bulk temperature of the liquid is below saturation, but the temperature of the heat transfer surface is above saturation. Vapor bubbles form at the heat transfer surface, but condense in the cold liquid so that no net generation of vapor is obtained.

A. Bulk boiling

B. Subcooled nucleate boiling

C. Total film boiling

D. Partial film boiling

QUESTION: 45

As heat is transferred to water adjacent to a heating surface, many factors influence steam bubble formation. Select the characteristic below that will ENHANCE steam bubble formation.

A. Chemicals dissolved in the water.

B. The absence of ionizing radiation exposure to the water.

C. A highly polished heat transfer surface with minimal scratches or cavities.

D. The presence of gases dissolved in the water.

QUESTION: 46

How does critical heat flux (CHF) vary with core height?

A. CHF increases from bottom to top of the core.

B. CHF decreases from bottom to core midplane, then increase from midplane to the top of the core.

C. CHF decreases from bottom to the top of the core.

D. CHF increases from bottom to core midplane, then decreases from midplane to the top of the core.

QUESTION: 47

Consider the temperature profile from the centerline of a fuel pellet to the centerline of the flow channel under 100 percent power conditions and single-phase cooling. Which of the following portions of the temperature profile will have the GREATEST temperature difference across it at the beginning of a fuel cycle?

A. Pellet-to-clad gap

B. Zircalloy cladding

C. Cladding corrosion film

D. Flow channel boundary layer

QUESTION: 48

Which of the following limits takes into consideration fuel-pellet swell effects?

A. Maximum average planar linear heat generation rate (MAPLHGR)

B. Linear heat generation rate (LHGR)

C. Critical power

D. Minimum critical power ratio (MCPR)

QUESTION: 49

At high core exposures, the MAPLHGR limit DECREASES with increasing core exposure.

What is the reason for this decrease?

A. Buildup of krypton and xenon gas reduces stress on cladding, thereby reducing MAPLHGR limit.

B. Zirconium-steam chemical reaction in cladding becomes less reactive with increased core age.

C. Fission product gases leak out of control rods, thereby reducing heat transfer coefficient.

D. Fission product gases have a lower heat transfer coefficient than the helium fill gas.

QUESTION: 50

Given the following initial core parameters:

$T_{\text{cladding-coolant interface}}$ = 500 degrees F
$T_{\text{fuel-cladding interface}}$ = 800 degrees F
$T_{\text{fuel centerline}}$ = 1400 degrees F

What would the fuel centerline temperature be if the FUEL thermal conductivity were doubled? (Assume reactor power is constant.)

A. 700 degrees

B. 950 degrees

C. 1100 degrees

D. 1250 degrees

QUESTION: 51

The fuel heat transfer time constant for a fuel assembly is 6 seconds. A power transient results in the step increase of the fuel centerline temperature.

Approximately how long would it take for the cladding temperature to reach its new steady state value?

A. 5 to 7 seconds

B. 11 to 13 seconds

C. 23 to 25 seconds

D. 29 to 31 seconds

QUESTION: 52

The pellet-to-clad gap in fuel rod construction is designed to:

A. decrease fuel pellet slump.

B. attenuate fission gammas.

C. increase heat transfer.

D. reduce internal clad strain.

QUESTION: 53

Studies of nuclear fuel rod damage revealed that two essential criteria for Pellet-Cladding Interaction (PCI) fuel damage are cladding stress and a chemical embrittling fission product interaction between two chemical agents and the zircalloy cladding.

What are the TWO (2) chemical agents?

A. Iodine and cadmium

B. Iodine and xenon

C. Krypton and tellurium

D. Ruthenium and samarium

QUESTION: 54

Brittle fracture of the reactor coolant pressure boundary is MOST LIKELY to occur at:

A. 120 degrees F, 10 psig.

B. 120 degrees F, 400 psig.

C. 400 degrees F, 10 psig.

D. 400 degrees F, 400 psig.

QUESTION: 55

Stress on the reactor vessel inner wall is greater during cooldown than heatup because:

A. both pressure stress and cooldown stress are tensile at the inner wall.

B. heatup stresses totally offset pressure stress at the inner wall.

C. cooldown stresses and heatup stresses are both tensile at the inner wall, but cooldown stresses are greater in magnitude.

D. the tensile cooldown stress at the inner wall is greater in magnitude than the compressive pressure stress at the same location.

QUESTION: 56

The probability of reactor vessel brittle fracture is DECREASED by minimizing:

A. oxygen content in the reactor coolant.

B. the time taken to cool down the reactor coolant system.

C. operation at high temperatures.

D. the amount of copper in the reactor vessel.

QUESTION: 57

The difference between the setpoint pressure at which a safety/relief valve opens and the pressure at which it closes is called:

A. blowdown.

B. accumulation.

C. setpoint tolerance.

D. setpoint deviation.

QUESTION: 58

A stop check valve is a modified check valve that:

A. cannot be shut remotely.

B. can be used to prevent flow in both directions.

C. can be opened manually to allow flow in both directions.

D. contains both a gate valve disk and a check valve disk.

QUESTION: 59

Operators should use BOTH hands on valve handwheels when positioning manual valves to:

A. overcome the resistance of installed locking devices.

B. control the rate of valve motion to prevent water hammer.

C. ensure system pressure, temperature, and flow are controlled during valve motion.

D. control lateral force to prevent bending the valve stem.

QUESTION: 60

The function of a valve backseat is to:

A. isolate system pressure from the packing and stuffing box to minimize packing leakage.

B. isolate system pressure from the packing and stuffing box for the purpose of valve repacking during normal system operation.

C. provide a backup means of flow isolation in the event of primary seat leakage.

D. provide a backup means of flow isolation in the event of a pipe break.

QUESTION: 61

A cooling water system is operating at steady-state conditions indicating 900 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1800 gpm, differential pressure (D/P) across the flow transmitter venturi will be approximately:

A. 85 psid.

B. 120 psid.

C. 175 psid.

D. 240 psid.

QUESTION: 62

A differential pressure (D/P) cell is being used to measure flow rate in a cooling water system. Flow rate is indicating 75 percent of scale. If the D/P cell diaphragm ruptures, INDICATED flow rate will:

A. go to 0 percent because low D/P is sensed.

B. go to 0 percent because high D/P is sensed.

C. go to 100 percent (full-scale) because low D/P is sensed.

D. go to 100 percent (full-scale) because high D/P is sensed.

QUESTION: 63

Which of the following will cause indicated volumetric flow rate to be LOWER than actual volumetric flow rate using a differential pressure (D/P) cell flow detector and a calibrated orifice?

A. Debris becomes lodged in the orifice.

B. A leak develops in the low pressure sensing line.

C. The orifice erodes over time.

D. System pressure decreases.

QUESTION: 64

Tank water level indication from a (wet) reference leg differential pressure level instrument will be LOWER than actual level when ambient temperature is _____ than calibration conditions or when there is a break in the _____ leg of the D/P cell.

A. less; reference

B. less; variable

C. greater; reference

D. greater; variable

QUESTION: 65

Which of the following is a disadvantage of a thermocouple when compared to a resistance temperature detector (RTD)?

A. Lower accuracy of measurement

B. Requires external power supply for measurement

C. Inability to withstand high temperatures

D. Slower response to temperature change

QUESTION: 66

If shorting occurs within a resistance temperature detector (RTD), indication will fail:

A. to mid-scale.

B. as is.

C. high.

D. low.

QUESTION: 67

An automatic tank level controller uses a potentiometer for manual adjustment of the level setpoint which is currently 60 percent. An operator increases the potentiometer setting to lower the level setpoint signal to a value previously known to maintain tank level at 50 percent. However, actual tank level stabilizes at 40 percent. The MOST LIKELY cause is that:

A. the potentiometer slide bar has developed a thin film of corrosion, thereby increasing the resistance of the potentiometer.

B. the potentiometer wiper has lost contact with the slide bar, thereby allowing only fine setpoint adjustments.

C. the potentiometer wiper and slide bar have developed a short circuit, thereby decreasing the resistance of the potentiometer.

D. the potentiometer locking device has not been released, thereby allowing only coarse setpoint adjustments.

QUESTION: 68

What is an advantage of operating a proportional neutron detector at a voltage at the high end (vice low end) of the proportional region?

A. Lower gas amplification factor prolongs detector life.

B. Better discrimination of highly charged particles in the presence of particles having lower specific ionization.

C. Decreases the space charge around detector anode ensuring the collected charge is proportional to the initial ionization.

D. Total charge collected is independent of the amount of primary ionizations.

QUESTION: 69

An ion chamber radiation detector is exposed to a constant gamma radiation field. If the applied voltage is increased but maintained within the ion chamber region, the rate of ion collection will _____. If the applied voltage is constant and the gamma radiation field is increased, the rate of ion collection will _____ the gamma radiation field strength.

A. increase; stay approximately the same

B. stay approximately the same; stay approximately the same

C. increase; increase

D. stay approximately the same; increase

QUESTION: 70

Scintillation detectors operate on the principle of:

A. gas amplification.

B. space charge effect.

C. luminescence.

D. photoionization.

QUESTION: 71

Why must an operator pay particular attention to auto/manual valve controllers left in the MANUAL mode?

A. Manual valve control is not as stable as automatic valve control.

B. Valve position will no longer change in response to changes in system parameters.

C. System parameters will no longer change in response to changes in valve position.

D. The valve can only be operated locally during manual valve control.

QUESTION: 72

What type of controller will return a process parameter to its setpoint value after a system transient?

A. Proportional

B. Proportional-Integral

C. Proportional-Functional

D. Proportional-Differential

QUESTION: 73

The purpose of a valve positioner in a typical pneumatic control system is to:

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

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

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

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

QUESTION: 74

The governor of an emergency diesel generator (D/G) DIRECTLY senses D/G _____ and adjusts D/G _____ flow to maintain a relatively constant D/G frequency.

A. load; air

B. speed; fuel

C. load; fuel

D. speed; air

QUESTION: 75

A centrifugal pump with no recirculation flow path must be stopped when discharge pressure reaches pump shutoff head to prevent:

A. bursting of the pump casing by subjecting it to excessively high pressure.

B. water hammer in downstream lines when system pressure drops to a value where the pumps can inject water.

C. overheating of the motor.

D. overheating of the pump.

QUESTION: 76

Which one of the following changes in plant status will bring the reactor recirculation system closer to the condition in which the recirculation pump will cavitate?

A. During a plant shutdown, reactor recirculation pump suction temperature decreases while reactor pressure remains constant.

B. Reactor recirculation pump speed is increased.

C. Reactor water level increases.

D. Extraction steam is isolated from one high pressure feedwater heater during power operations.

QUESTION: 77

Which of the following is an indication of pump runout?

A. High discharge pressure

B. Low pump motor current

C. High pump vibration

D. Low pump flow rate

QUESTION: 78

Increasing the flow rate from a centrifugal pump by throttling open the discharge valve will cause pump head to:

A. increase and stabilize at a higher value.

B. decrease and stabilize at a lower value.

C. remain constant because pump head is a design parameter.

D. increase, then decrease following the pump's efficiency curve.

QUESTION: 79

A positive displacement pump (PDP) is operating in an open system. PDP parameters are as follows:

PDP speed - 1000 rpm
PDP discharge pressure - 2000 psig
PDP suction pressure - 50 psig
PDP flow rate - 150 gpm

Which one of the following changes will cause PDP flow rate to exceed 200 gpm?

A. A second identical discharge path is opened.

B. Increase PDP speed to 1500 rpm.

C. Increase PDP suction pressure to 120 psig.

D. Decrease downstream system pressure to 1000 psig.

QUESTION: 80

The available net positive suction head (NPSH) for a pump may be expressed as:

A. discharge pressure minus saturation pressure of the fluid being pumped.

B. discharge pressure minus suction pressure.

C. suction pressure minus saturation pressure of the fluid being pumped.

D. suction pressure plus discharge pressure.

QUESTION: 81

A closed system has one operating positive displacement pump in service. A second positive displacement pump is subsequently placed into service. If the pumps are in parallel, the system flow rate will _____ and the system discharge pressure will _____.

A. stay approximately the same; stay approximately the same

B. approximately double; stay approximately the same

C. stay approximately the same; approximately double

D. approximately double; approximately double

QUESTION: 82

A centrifugal pump is operating with the following parameters:

Speed = 1,800 rpm
Current = 40 amperes
Pump Head = 20 psi
Pump Flow Rate = 400 gpm

What will be the new value of pump head and current if the speed is increased to 2,000 rpm?

A. 22 psi, 44 amps

B. 25 psi, 44 amps

C. 22 psi, 55 amps

D. 25 psi, 55 amps

QUESTION: 83

Which of the following best describes the motor current indications that would be observed during the start of a large A.C. motor at full load?

A. Amps slowly increase to the full-load value over a period of five time constants.

B. Amps immediately increase to the full-load value.

C. Amps immediately increase to many times the full-load value and then decrease to the full-load value.

D. Amps immediately increase to the full-scale value and then decrease rapidly to zero due to overload protection.

QUESTION: 84

The frequency of large AC motor starts should be limited to prevent excessive:

A. torsional stresses on the motor shaft.

B. wear of internal pump components.

C. arcing and degradation of motor breaker contacts.

D. heat buildup within the motor.

QUESTION: 85

A 24,000 VAC generator is operating at 800 MWe, 20,700 amperes, and a negative 316 MVAR. What is the power factor?

A. 0.93 leading

B. 0.93 lagging

C. 0.91 leading

D. 0.91 lagging

QUESTION: 86

During normal steady-state plant operation at 50 percent load, which one of the terms in the formula, $\dot{Q} = UA(T1-T2)$, is (affected the most, and therefore) most responsible for the initial increase in heat transfer rate from the reactor fuel during a minor (3 percent) steamline break? Assume the void boundary is unchanged.

A. U

B. A

C. T1

D. T2

QUESTION: 87

Considering a lube oil cooler for which the inlet oil and inlet cooling water temperatures are constant, increasing the oil flow rate through the cooler will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____.

A. increase, increase

B. increase, decrease

C. decrease, increase

D. decrease, decrease

QUESTION: 88

During normal steady-state plant operation with a constant generator load, plugging of one percent of the tubes in the main condenser will cause absolute pressure in the condenser to _____ and hotwell temperature to _____.

A. increase; increase

B. decrease; increase

C. increase; decrease

D. decrease; decrease

QUESTION: 89

With the plant operating at full power, increased condensate conductivity will result from which of the following?

1. Condenser shell crack
2. Cooling water tube failure

A. 1. only

B. 2. only

C. Both 1. and 2.

D. Neither 1. or 2.

QUESTION: 90

A crack in the shell of the main condenser will cause cooling water outlet temperature to _____ and hotwell temperature to _____.

A. increase; decrease

B. decrease; decrease

C. increase; increase

D. decrease; increase

QUESTION: 91

Which of the following describes the PRIMARY purpose of a demineralizer?

A. To increase the number of ions in water.

B. To reduce the conductivity of water without affecting its pH.

C. To increase the pH of water by reducing the number of positively charged ions in it.

D. To remove particles and suspended solids from water.

QUESTION: 92

The temperature of the water passing through a demineralizer must be controlled because EXCESSIVELY HOT water will:

A. accelerate the ion exchange process and change effluent pH.

B. degrade the corrosion inhibitor applied to the inner wall of the demineralizer.

C. result in demineralizer retention element thermal expansion, thereby releasing resin.

D. reduce the affinity of the demineralizer resin for ion exchange.

QUESTION: 93

A demineralizer that is continuously exposed to flowing water with high concentrations of suspended solids will FIRST develop an increase in:

A. conductivity at the demineralizer outlet.

B. decontamination factor across the demineralizer.

C. differential pressure across the demineralizer.

D. flow rate through the demineralizer.

QUESTION: 94

The FIRST indication of resin depletion in the effluent of a demineralizer is:

A. an increase in suspended solids.

B. a decrease in chlorides.

C. an increase in the conductivity.

D. an increase in resin fines.

QUESTION: 95

The following indications are observed for a breaker.

Red indicating light is on
Green indicating light is off
Load voltage indicates 0 volts
Line voltage indicates 480 volts

What is the condition of the breaker?

A. Open and racked in

B. Shut and racked in

C. Open and racked to "test" position

D. Shut and racked to "test" position

QUESTION: 96

A thermal overload device for a large motor protects the motor from:

A. sustained overcurrent by opening motor line contacts at the motor.

B. instantaneous overcurrent by opening motor line contacts at the motor.

C. sustained overcurrent by opening the motor breaker.

D. instantaneous overcurrent by opening the motor breaker.

QUESTION: 97

Closing a circuit breaker between two electrical generators that are out of phase will cause:

A. sustained high currents circulating between the generators.

B. a voltage reduction in both generators until normal voltage is manually restored.

C. a sudden large mechanical torque on both generators.

D. a frequency reduction in both generators until normal frequency is manually restored.

QUESTION: 98

The PRIMARY reason for isolating emergency electrical loads from their power supply bus prior to energizing the bus via the emergency diesel generator is to prevent:

A. an overcurrent condition on the generator.

B. an overcurrent condition on the loads.

C. an underfrequency condition on the generator.

D. an underfrequency condition on the loads.

QUESTION: 99

While paralleling the main generator to the grid, the generator breaker must be closed as the synchroscope pointer approaches the 12 o'clock position to prevent:

A. motoring of the generator due to unequal frequencies.

B. excessive arcing within the generator output breaker due to unequal voltages.

C. excessive MWE load transfer to the generator due to unequal frequencies.

D. excessive heating of the generator windings due to excessive surge current.

QUESTION: 100

Loss of breaker control power will prevent:

A. local closing of the breaker.

B. local tripping of the breaker.

C. the breaker from tripping on interlock.

D. the breaker from tripping on overcurrent.