UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

ENCLOSURE 1

EXAMINATION REPORT - 50-327/OL-86-03

Facility Licensee: Tennessee Valley Authority

Facility Name: Sequoyah Nuclear Plant

Facility Docket No.: 50-327

Written and simulator examinations were administered at Sequoyah Nuclear Plant near Soddy-Daisy, Tennessee.

Chief Examiner: William M. Dean 2/13/87
William M. Dean Date Signed

Approved by: John F. Munro 2/13/87
John F. Munro, Section Chief Date Signed

Summary:

Examinations on December 15-18, 1986

Written and simulator examinations were administered to 4 licensed reactor operators (RO) and 8 senior reactor operators (SRO). Based on the results of these examinations, 1 of 4 ROs and 7 of 8 SROs passed.

REPORT DETAILS

1. Facility Employees Contacted:

*P. R. Wallace, Plant Manager
*L. M. Nobles, Plant Superintendent
*C. H. Noe, Chief, Operator Training
*C. O. Brewer, Operations Training Manager

*Attended Exit Meeting

2. Examiners:

*W. M. Dean
D. J. Nelson
L. L. Lawyer
C. Shiraki (HQ)
J. Whittemore (RIV)

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners provided your training staff with a copy of the written examination and answer key for review. The comments made by the facility reviewers are included as Enclosure 3 to this report, and the NRC Resolutions to these comments are listed below.

a. RO Requal Examination (applicable SRO questions in parenthesis)

1. Question 1.01 (5.01)

Comment accepted. Original answer key responses based on actual power vs. instrument vice instrument vs. actual power as stated in the question.

2. Question 1.03 (5.03)

Comment accepted. Typographical error in the answer key will be corrected.

3. Question 1.07

Comment accepted. Note that curves provided by utility showing temperature and doppler defects for cycle 4 core were not provided with original material sent to the NRC.

4. Question 1.09

   Recommended answer is equivalent to existing answer key. No change required.

5. Question 1.10 (5.08)

   Comment accepted. Question did not delineate between fast and thermal fission. The recommended additional answer will also be accepted with same tolerances as original answer key.

6. Question 2.03

   H2 recombiners are referred to in FR-Z.1, "Response to High Containment Pressure" and in SOI-8.3.1, "Containment H2 Recombiner System" for mitigation of excessive containment hydrogen concentration. Requalification examinations should be based primarily on requalification training material, per ES-601 of NUREG 1021, however, material considered pertinent to requisite operator knowledge is also appropriate as a source of information for examination questions. Due to the relatively low KA value (2.6) and the fact that Sequoyah has no requalification learning objectives nor lesson plans for hydrogen recombiners (though they should if they are still an applicable system) the question is deleted.

7. Question 2.04

   Comment accepted. Based on additional material provided by the facility, recommended additional answers will also be accepted. Lesson plan should be modified to reflect this information.

8. Question 2.06

   Comment accepted. Based on information contained in Technical Specifications, the band for part c will be 1185-1285 psig.

9. Question 2.09

   Comment accepted. Recent changes to AOI-3B are not reflected in the referenced system description. As there are no other ECCS related components removed from service, and the question asks for 4 responses, the candidates will not be penalized for listing the two components which are removed from service, but not necessarily tagged out.

10. Question 2.11 (6.11)

The order of elements in the Air Cleanup Units is considered important to the overall effective operation of these accident mitigating components. However, based on facility supplied drawing, the electric heating element will be removed from the answer key. System description should be changed to reflect the actual plant conditions.

11. Question 3.03

Comment accepted. Based on additional reference material provided, recommended answer will be accepted. System description should be changed to reflect this additional alarm.

12. Question 3.05

Comment accepted. Confusing wording in facility's system description resulted in erroneous answer key.

13. Question 3.07 (6.06)

Comment accepted. Based on system drawing provided, recommended answers will be accepted.

14. Question 3.10 (6.07)

Comment accepted. Based on system drawings provided by facility demonstrating an EDG lockout will not occur, question is deleted.

15. Question 4.05 (7.04)

Comment accepted. Question symbology could have confused candidates into responding to "2 out of 4" vice "numbers 2 and 4" S/Gs.

16. Question 4.10

Comment accepted. Additional recommended answer will be accepted.

17. Question 4.15 (7.12)

Comment accepted. Based on additional material provided, recommended answer will be accepted as 1 of 2 correct answers.

b. SRO Requal Examination

1. Question 5.05

Comment not accepted. The question states use of a EOL critical boron concentration vice a BOL boron concentration. Typically, these values are different by hundreds of ppm.

2. Question 5.11

Recommended answers are equivalent to existing answer key. No change to answer key is required.

3. Question 6.04

Recommended answer is equivalent to existing answer key. No change required.

4. Question 7.08

Comment accepted. Even though fuel movement less than 100 hours is discussed in the referenced procedures, it is agreed that this answer may not be elicited as such an occurrence would not be feasible based on Technical Specification requirements. Reasonable third answers will be accepted in lieu of this response.

5. Question 7.13

Comment not accepted. A key factor discussed in the Westinghouse Background Information for FR-H.1 "Response to Loss of Secondary Heat Sink", is the effectiveness of the energy removal of the PORVs during bleed and feed procedures . Though the specific phrase given in the answer key is not identically stated, this is a well known phenomenon discussed in Westinghouse accident analysis.

An additional answer that will be accepted, as stated on page 55 of the above reference is "higher pressure produced by RCP operation will reduce SI flow and increase inventory lost through the PORVs".

6. Question 8.03

Comment accepted. Question should have said "only plant Health Physicist" to elicit response in answer key. Answer will be changed as recommended.

c. Post Examination Review

In addition to the changes made to the answer key due to facility comments, post examination review resulted in minor technical or administrative changes to questions 1.05(5.04), 2.12(6.13), 6.12, 7.07, and 8.14 in order to ensure the answer key reflects the response elicited by the questions.

4. Exit Meeting

At the conclusion of the site visit the examiners met with representatives of the plant staff to discuss the results of the examination. The submittal by the facility of some inadequate training material to the NRC was addressed. Fifty percent (9 of 18) of the changes made to the answer keys were a direct result of incomplete or insufficient training material. It was determined that training material presented to personnel prior to their pre-licensing training would, in selected instances, be suitable for submittal of material used in examination development. Additionally, a complete set of system drawings and logic prints should be made available to the examiners to supplement the system descriptions typically provided.

The cooperation given to the examiners and the effort to ensure an atmosphere in the control room conducive to oral examinations was also noted and appreciated.

The licensee did not identify as proprietary any of the material provided to or reviewed by the examiners.

NRC MASTER

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR REQUALIFICATION EXAMINATION

FACILITY: SEQUOYAH 1&2

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 86/12/15

EXAMINER: DEAN, W M

CANDIDATE: _____

INSTRUCTIONS TO CANDIDATE:

Read the attached instruction page carefully. This examination replaces the current cycle facility administered requalification examination. Retraining requirements for failure of this examination are the same as for failure of a requalification examination prepared and administered by your training staff. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up four (4) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
17.5 ~~18.00~~	25.17	_____	_____	1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
16.25 ~~17.00~~	24.48	_____	_____	2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
15.5 ~~18.00~~	25.17	_____	_____	3. INSTRUMENTS AND CONTROLS
17.75 ~~18.00~~	25.17	_____	_____	4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
67.0 ~~71.00~~		_____ Final Grade		Totals

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

_____
Candidate's Signature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

3. Use black ink or dark pencil only to facilitate legible reproductions.

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

5. Fill in the date on the cover sheet of the examination (if necessary).

6. Use only the paper provided for answers.

7. Print your name in the upper right-hand corner of the first page of each section of the answer sheet.

8. Consecutively number each answer sheet, write "End of Category __" as appropriate, start each category on a new page, write only on one side of the paper, and write "Last Page" on the last answer sheet.

9. Number each answer as to category and number, for example, 1.4, 6.3.

10. Skip at least three lines between each answer.

11. Separate answer sheets from pad and place finished answer sheets face down on your desk or table.

12. Use abbreviations only if they are commonly used in facility literature.

13. The point value for each question is indicated in parentheses after the question and can be used as a guide for the depth of answer required.

14. Show all calculations, methods, or assumptions used to obtain an answer to mathematical problems whether indicated in the question or not.

15. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK.

16. If parts of the examination are not clear as to intent, ask questions of the examiner only.

17. You must sign the statement on the cover sheet that indicates that the work is your own and you have not received or been given assistance in completing the examination. This must be done after the examination has been completed.

18. When you complete your examination, you shall:

a. Assemble your examination as follows:

(1) Exam questions on top.

(2) Exam aids - figures, tables, etc.

(3) Answer pages including figures which are part of the answer.

b. Turn in your copy of the examination and all pages used to answer the examination questions.

c. Turn in all scrap paper and the balance of the paper that you did not use for answering the questions.

d. Leave the examination area, as defined by the examiner. If after leaving, you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION 1.01 (1.50)

Indicate whether the following will cause the power range instrument to be indicating HIGHER, LOWER or the SAME as actual power, if the instrument has been adjusted to 100% based on a calculated calorimetric.

a. If the feedwater temperature used in the calorimetric was higher than actual feedwater temperature.

b. If the reactor coolant pump heat input used in the calorimetric is omitted.

c. If the steam flow used in the calorimetric was lower than actual.

QUESTION 1.02 (1.00)

The reactor is critical at 10,000 cps when a S/G PORV fails open. Assuming BOL conditions, no rod motion, and no reactor trip, choose the answer below that best describes the values of Tavg and nuclear power for the resulting new steady state. (POAH = point of adding heat).

a. Final Tavg greater than initial Tavg, Final power above POAH.

b. Final Tavg greater than initial Tavg, Final power at POAH.

c. Final Tavg less than initial Tavg, Final power at POAH.

d. Final Tavg less than initial Tavg, Final power above POAH.

QUESTION 1.03 (1.00)

Attached Figure # 219 shows a power history and four possible xenon traces (reactivity vs time). Select (a, b, c, or d) the curve that correctly displays the expected xenon transient for the given power history.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.04 (1.00)

Which of the following correctly describes the projected changes in the worth of the Control Banks during cycle 4?

	BANK A	BANK B	BANK C	BANK D
a.	Constant	Constant	Increase	Increase
b.	Decrease	Increase	Increase	Constant
c.	Constant	Decrease	Increase	Constant
d.	Increase	Increase	Increase	Increase
e.	Increase	Increase	Constant	Decrease

QUESTION 1.05 (1.00)

For the Cycle 4 core, what is the main core design reason that the pellet swell and clad creep effects override the Pu-240 buildup/U-238 depletion effects and make the Doppler Only Power Coefficient less negative?

QUESTION 1.06 (1.00)

Unit A is at EOL while Unit B has just been started up after a refueling. Assuming a rod speed of 48 spm, both reactors are taken critical by pulling in 50 step increments and waiting 60 seconds before pulling again. Assuming all systems and parameters are identical at the commencement of the startup, and both units are initially shutdown by 2% (delta k/k):

a) Which Unit will have the highest source range counts when criticality is reached?

b) How will critical rod heights compare in the two Units?

QUESTION 1.07 ~~(1.00)~~ (0.5)

a) ~~Which power defect is the major contributor to the Total Power Defect at EOL?~~ deleted

b) What is the major cause of the existence of a void defect?

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.08 (1.50)

a) Assuming a SBLOCA has occurred, what two FLUID FLOW related factors and what two HEAT TRANSFER related factors will dictate the behavior of RCS pressure? (1.0)

b) What is the driving force for the flow out of the break? (0.5)

QUESTION 1.09 (1.00)

List the four most significant causes of Non-condensible gas formation in the RCS during the first hour following a LOCA. Assume the PZR empties after several minutes and forced convection flow is not available. Also, pressure does not drop to a level requiring any SI tank to inject and fuel rods have not ruptured.

QUESTION 1.10 (1.50)

List the three main sources of fission neutrons in the core at end of life and indicate their approximate contribution (in %) to power.

QUESTION 1.11 (2.00)

a. During natural circulation, EXPLAIN how it is possible to form a bubble in the reactor vessel head when indications show that the RCS is subcooled?

b. How will pressurizer level respond, (INCREASE,DECREASE, or REMAIN THE SAME) if the backup heaters are energized with a bubble in the reactor vessel head? Assume normal pressurizer level and briefly EXPLAIN your answer.

QUESTION 1.12 (1.50)

Attached is a typical boiling curve for water as it approaches, then exceeds, the DNB point. What are the thermodynamic conditions that cause:

a) The decrease in heat transfer rate in Region III?

b) The increase in heat transfer rate in Region IV?

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.13 (2.00)

Using the attached drawings, explain why the parameters below exhibit the behavior represented on the graphs which show the response to a rapid 50% load decrease from rated power with rod control in AUTOMATIC and Steam Dumps to the Condenser UNAVAILABLE. Assume NO operator action.

a) Why does rod motion stop at point 8? (.75)

b) Why are there oscillations in steam flow, feed flow and S/G level at points 11-13? (1.25)

QUESTION 1.14 (1.00)

The calculated shutdown margin is 10% delta k/k, assuming the most reactive control rod worth is 1000 pcm. The Source Range count rate is 50 cps. The Shutdown Banks' rod worth is 5600 pcm. Calculate the final count rate after the Shutdown Banks are fully withdrawn. Show all work.

(***** END OF CATEGORY 01 *****)

QUESTION 2.01 (1.00)

Which one of the following correctly describes the detector construction of a Particulate, Gas, Iodine (PIG) radiation monitor?

a) One scintillation detector utilizing three different energy bandwidths(windows) for sensitivity to different isotopes.

b) One scintillation detector utilizing two different energy bandwidths for particulate and Iodine detection and a GM tube for gaseous detection.

c) Two separate scintillation detectors for particulate and Iodine detection and a GM tube for gaseous detection.

d) Three separate scintillation detectors for each monitored group of radio nuclides.

QUESTION 2.02 (1.00)

RHR inlet isolation valves 74-1 and 74-2 each have an independent RCS pressure transmitter associated with them. Which of the following statements describing the effects of the transmitter associated with 74-1 failing high is correct?

a. If both 74-1 and 74-2 are open, they will shut.

b. If open, 74-1 will shut and if closed, 74-2 will not be able to be opened.

c. If both 74-1 and 74-2 are shut, neither one will be able to be opened.

d. If open, 74-1 will shut, but 74-2 can be positioned as desired.

e. 74-1 can be positioned as desired by the operator, but 74-2 will not be able to be opened if it is shut.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.03 (1.00)

Which of the following describes the basic flowpath through the Hydrogen Recombiners?

a. Mixing chamber, pre heater, recombination region
b. Mixing chamber, recombination region, heater section
c. Pre heater, recombination region, mixing chamber
d. Pre heater, mixing chamber, recombination region
e. Pre heater, mixing chamber, heater section

QUESTION 2.04 (2.00)

a) For the following loads, indicate what combination of ERCW headers (1A, 1B, 2A and/or 2B) is the NORMAL source of cooling water:

1) CCS Heat Exchanger "C"
2) EDG Heat Exchanger 2A-A
3) Containment Spray Heat Exchanger 1B

b) What 5 criteria/interlocks must be met for ERCW pump KA to auto start?

QUESTION 2.05 (2.00)

List the four AUTOMATIC trips of the AFW Terry Turbine trip and throttle valve and whether the trip has to be reset MANUALLY or NOT.

QUESTION 2.06 (1.00)

Provide the system pressures at which the following ECCS components will start to inject following a LOCA: (use criteria stated in EOPs)

a) SI Pumps
b) RHR pumps
c) Upper Head Injection

QUESTION 2.07 (1.50)

List the three interlocks which must be met, including applicable setpoints for switchover to the Recirculation Mode of core cooling to occur.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.08 (1.00)

List the four locations from which the Post Accident Sampling System can draw samples.

QUESTION 2.09 (1.00)

What 4 different ECCS related components are tagged out at low pressures to help prevent inadvertant over pressurization at low temperatures?

QUESTION 2.10 (1.50)

Recent modifications to the S/G PORVs added manual operator extensions for remote operation of the valves on 2 S/Gs.

a) Which 2 S/Gs were affected by this modification? (0.5)

b) What is the basis for this modification? (Include discussion of why only 2 S/G PORVs were modified)

QUESTION 2.11 ~~(1.50)~~ ~~(1.375)~~ (1.25)

a) Describe the order of processing elements in the Air Cleanup Units through which air is drawn by the Air Cleanup Subsystem. ~~(1.0)~~ (.875)

b) How are the processing elements in an INACTIVE air cleanup unit loaded with radioactive material kept cool? (0.5)

QUESTION 2.12 (1.50)

Describe Both of the flow paths for hot leg recirculation, from the recirculation sumps to the RCS. Identify major components and any valves which can be operated from the control room. (Use only the A Train)

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.13 (1.50)

Provide the bases for the following precautions relating to turbine and generator operation during a plant startup:

a) Operation at less than 5% rated load should be avcided.

b) The main generator field should not be energized at less than 90% rated speed.

c) EHC fluid should be > 70 degrees when starting an EHC pump.

(***** END OF CATEGORY 02 *****)

QUESTION 3.01 (1.00)

Which one of the following describes how the AFW system is prevented from feeding a faulted S/G?

a) Operator action is required to isolate AFW when a faulted S/G is detected.

b) Pressure switches on the AFW discharge lines will automatically close the loop level control valves when low AFW discharge pressure is detected.

c) Level transmitters on the S/G wide range level instrument will automatically close the loop level control valve when a low level is detected in a S/G.

d) Flow transmitters on the AFW discharge lines will automatically close the loop level control valves when excessive flow is detected in AFW discharge piping.

QUESTION 3.02 (1.00)

Which one of the graphs A-D in figure 603 correctly depicts the Pressurizer Pressure control system, Master Controller output signal, based upon the demand signal shown?

QUESTION 3.03 (1.25)

Describe what happens to the coils associated with the CRDMs and what 2 alarms/indications actuate on an Urgent Failure of the rod control system.

QUESTION 3.04 (1.50)

Indicate whether the following situations will ARM ONLY, ARM AND ACTUATE or HAVE NO EFFECT on the steam dump system.

a) 80% power, 7.5%/min ramp decrease in turbine load for 3 minutes, Tavg>Tref by 7 degrees F, steam dumps in Tavg mode of operation

b) Hot Zero Power, Tavg=549 degrees F, steam dumps in STM PRESS mode with 1005 psig set into the steam pressure controles, steam dumps in Tavg mode.

c) Turbine trip, Tavg=542 degrees, steam dumps in Tavg mode

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.05 (.50)

TRUE or FALSE: If the upper detector on a power range NI fails low while at 75% power, the operation of the upper detector current comparator is defeated.

QUESTION 3.06 (1.50)

While at 100% power with rod control in automatic, the Turbine Impulse Channel supplying the rod control logic fails high. What is the effect on the following rod control system components?

a) Variable Gain Unit
b) Tavg-Tref mismatch
c) Rod speed

QUESTION 3.07 (1.50)

What 4 signals will automatically initiate the operation of the Auxiliary Building Gas Treatment System?

QUESTION 3.08 (1.50)

List ALL of the signal inputs to the OT Delta T trip point calculator.

QUESTION 3.09 (1.75)

List ALL the Main Steam Isolation Signals and their setpoints.

QUESTION 3.10 (1.50) deleted

An SI signal was generated due to a transient caused by an undervoltage condition on the 2A-A 6.9KV Bus. During this transient, the 2A CHG Pump breaker stayed closed causing an EDG lockout.(all other loads were removed) What 5 actions must the operator take to load equipment on that bus using the 2A-A EDG?

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.11 (2.50)

Describe all events/alarms that occur due to the following instrument failures until the reactor either trips or stabilizes. Assume no operator actions and all controls are in automatic.

a) Pressurizer Level Reference Signal (Tavg) fails high while at 50% power. (0.75)

b) Selected Secondary Pressurizer Level Control Channel signal fails low while at 70% power. (1.75)

QUESTION 3.12 (1.00)

Unit 1 is at 60% power with all controls in automatic, operating normally when Pzr Pressure protection Channel III is taken out of service for testing (all associated bistables are tripped). Subsequently, the upper detector for NI42 fails HIGH. What happens to the turbine? Explain your answer.

QUESTION 3.13 (1.50)

Describe the operation of the 6.9 VAC Emergency Bus Degraded Voltage Protection System. Include in your discussion coincidences, setpoints and any time delays that apply.

(***** END OF CATEGORY 03 *****)

QUESTION 4.01 (1.00)

Which one of the following situations does NOT require emergency boration per AOI-34.A, "Emergency Boration"?

a) One rod stuck in the fully withdrawn position following a rx trip.

b) ROD BANK D LOW LIMIT alarm actuates as rods are driving in automatically.

c) A steady, sustained increase in source range counts with keff=.95 with no rod motion or planned dilution in progress.

d) RCS Tavg falls below 525 degrees at a rate of 30 degrees/hr after a reactor trip. (No manual cooldown in progress)

QUESTION 4.02 (1.00)

Which one of the following conditions are the correct MINIMUM requirements for starting "B" RHR pump while swapping RHR pumps during normal MODE 5 operations?

	Pump A status	RCS Level
a)	On	695'
b)	Off	695'
c)	On	695' 6"
d)	Off	695' 6"
e)	On	696'

QUESTION 4.03 (1.00)

Which one of the following is addressed in FR-Z.2, "Containment Flooding", as a potential source of excessively high containment sump levels?

a) Condensed steam from a steam break
b) RCS water from a LOCA
c) RWST
d) Accumulators
e) CCW

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.04 (1.00)

Which one of the following statements correctly describes the use of NOTES and CAUTIONS in an EOP?

a) BOTH Notes and Cautions apply ONLY to the step which they precede (Unless otherwise stated in the Note/Caution).

b) Notes apply ONLY to the step they precede, whereas Cautions apply to ALL subsequent steps (Unless otherwise stated in the Note/Caution).

c) Notes apply to ALL the steps they precede, whereas Cautions ONLY apply to the step they precede (Unless otherwise stated in the Note/Caution).

d) Notes and Cautions apply to ALL steps which they precede (Unless otherwise stated in the Note/Caution).

QUESTION 4.05 (1.00)

The loss of which one of the following 125 VDC Vital Battery Boards will cause a reactor trip and also number 2/4 S/G MSIVs and main feed regulating bypass valves to close?

a) Unit 2, Board I
b) Unit 1, Board II
c) Unit 2, Board III
d) Unit 1, Board IV

QUESTION 4.06 (.50)

TRUE or FALSE: The turbine should be tripped as an immediate action if the reactor trip breakers fail to open upon a legitimate trip signal.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.07 (1.00)

Indicate whether each of the following statements regarding EOP usage is TRUE or FALSE:

a) If an expected response of an EOP can NOT be verified and the Response Not Obtained action can NOT be performed, the operators may continue with the procedure.

b) If a task is in progress when a transition to another procedure takes place, that task need NOT be completed.

QUESTION 4.08 (1.00)

Indicate whether the following statements are TRUE or FALSE:

a) Neglecting emergency situations, it is not permissable for a TVA employed individual to receive occupational exposure during a calender quarter if he has already received 3 Rem during that time.

b) An RWP is necessary to enter a Regulated Area.

QUESTION 4.09 (1.00)

Put the following actions associated with starting the FIRST Control Rod Drive MG set in the correct order:

1) Flash the field
2) Close the Auxiliary 150 VAC supply breaker to rod drives
3) Adjust generator voltage
4) Close the motor circuit breaker
5) Close the generator circuit breaker

QUESTION 4.10 (.75)

Aside from the on-shift SE (Shift Engineer), what other 3 personnel may authorize clearances at Sequoyah Nuclear Plant?

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.11 ~~(2.25)~~ (2.00) see replacement question

What are all the immediate actions/verifications if there is a need to evacuate the control room due to the presence of smoke in the control room? Assume the reactor and turbine have been tripped already.

QUESTION 4.12 (2.00)

What are ALL the actions contained in the RESPONSE NOT OBTAINED column in FR-S.1, "ATWS", for the steps listed below? Ensure you discuss any contingency actions stated within the RNO step itself.

a) Turbine is NOT verified as tripped.

b) Pressurizer pressure exceeds 2335 psig.

QUESTION 4.13 (1.50)

List 5 acceptable methods by which Independent Verification of electrical breaker alignments may be accomplished.

QUESTION 4.14 (1.00)

Why is the S/G atmospheric PORV NOT isolated while performing E-3, "SGTR", but is only verified shut < 1040 psig and that its controller is in AUTO?

QUESTION 4.15 (1.00)

EOP E-3, "SGTR", requires the operator to maintain AFW flow to the ruptured S/G until narrow range level is established. Provide two reasons for this procedural requirement.

QUESTION 4.16 (1.00)

Why is a MINIMUM of 0.2 gpm #1 seal leak off flow important when preparing to start an RCP? Include in your discussion the primary cause preventing establishment of this flow rate during startup preparations.

(***** END OF CATEGORY 04 *****)

(********** END OF EXAMINATION **********)

REPLACEMENT QUESTION FOR RO REPLACEMENT 4.16
SRO REPLACEMENT 7.16
RO REQUAL 4.11
SRO REQUAL 7.10

a) DESCRIBE THE BASIC STEPS INVOLVED IN CLOSING ALL 4 MSIV's AFTER A CONTROL ROOM EVACUATION HAS BEEN INITIATED. ASSUME THE OPERATOR HAS NOT LEFT THE CONTROL ROOM, AND THAT THE TURBINE AND REACTOR HAVE ALREADY BEEN TRIPPED. (1.0)

b) WHAT 3 ITEMS DOES AOI-27A, "CONTROL ROOM INACCESSIBILITY" REQUIRE/RECOMMEND THE OPERATORS TAKES WITH THEM TO THE AUXILIARY CONTROL ROOM FOR USE AS REFERENCE MATERIAL? (1.0)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

NRC

ANSWER 1.01 (1.50)

a. ~~Higher~~ LOWER (+.5 ea)
b. ~~Lower~~ HIGHER
c. ~~Higher~~ LOWER

REFERENCE
NUS Vol 4, pp 2.2-4

015/000; A1.01(3.5/3.8)

ANSWER 1.02 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, Section I-5, MTC and Power Defect
DPC, Fundamentals of Nuclear Reactor Engineering
St Lucie Reactor Physics, Section 7.6 & 7.7

039/000; A2.05(3.3/3.6)

ANSWER 1.03 (1.00)

b

REFERENCE
EIH: GPNT,Vol VII, Chapter 10.1-83-86
BSEP: L/P 02-2/3-A, pp 172 - 176; 02-OG-A, pp 57 - 60
Westinghouse Nuclear Reactor Theory, pp. I-5.77 - 79
Turkey Point, Reactor Core Control, pp. 4-24 - 28

001/000-K5.13 (3.7/4.0)

ANSWER 1.04 (1.00)

b

REFERENCE
SQN Reactor Physics Review, pp 21/22

001/000; K5.02(2.9/3.4)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 1.05 (1.00)

(A low leakage loading pattern has been employed which places) new fuel assemblies loaded in the center of the core ~~(+.5)~~ (+.2 These assemblies see a higher flux for a longer period ~~(+.25)~~, accelerating the effects of pellet swell and clad creep relative to earlier cycles ~~(+.25)~~)

REFERENCE
SQN Reactor Physics Review, pp 18/19

001/000; K5.49(3.4/3.7)

ANSWER 1.06 (1.00)

a) Will be the same (+.5 ea)
b) Unit B will be higher

REFERENCE
Westinghouse Reactor Core Control, pp 6-23/26
Westinghouse Fundamentals of Nuclear Reactor Theory, pp 8-48/60

001/010; K5.08(2.9/3.2) & 001/000: K1.05(4.5/4.4)

ANSWER 1.07 ~~(1.00)~~ (0.5)

~~a) Doppler defect (+.5)~~ Deleted
b) Nucleate boiling

REFERENCE
Westinghouse Reactor Core Control, pp 3-38/42

001/000; K5.49(3.4/3.7)

ANSWER 1.08 (1.50)

a) Mass flow out vs. SI flow in (+.5 ea)
energy produced by decay heat vs. energy removed
b) Delta P between RCS and containment

REFERENCE
SQN SBLOCA Analysis, pp 5

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

EPE-009;EK1.01(4.2/4.7)

ANSWER 1.09 (1.00)

1) Dissolution of H2 (due to mass loss and pressure drop) (+.25 ea)
2) Radiolysis
3) PZR vapor space expansion
4) Zirc-water reaction

REFERENCE
SQN EGT 222.006, pp 23

EPE-009; EK3.11(4.4/4.5)

ANSWER 1.10 (1.50)

Pu-239 37% (+/-3) (+.3 for isotope, +.1 for %, +.1 for correct order)
U-235 35.5% --thermal fission
U-235 8% --fast fission

OR U-235 43%
Pu-239 40%
U-238 8%
Pu-241 = 7% maybe a fluid choice

REFERENCE
SQN/WBN License Cert Trng, "Reactor Kinetics", pp 6
St Lucie Reactor Physics Section 7.6.7; SD 1, pp 33

001/000; K5.47 (2.9/3.4)

ANSWER 1.11 (2.00)

a. Subcooling is based on core exit T/Cs or hot leg RTD readings. During natural circulation the mass of metal in the head can retain heat and keep local temperatures above saturation. The temperature indicators would not reflect this local saturated condition. (1.0)

b. Pressurizer level decreases because the pressurizer pressure increase will compress the vessel void and force water out of the pressurizer. (1.0)

REFERENCE
G.P. Heat Transfer and FF Pp 355-358

EPE-074; EA2.05(3.4/4.2) & EA2.07(4.1/4.7)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 1.12 (1.50)

a) > DNB, have partial film boiling, where the fuel rod is alternately covered with steam and water (+.25). Steam has poor thermal conductivity capabilities (+.25), so heat transfer rate drops and Delta T rises (+.25)

b) As fuel surface temperatures rise, stable steam layer forms (+.25) causing a further increase in fuel rod temperatures (+.25). Eventually, significant radiative heat transfer occurs causing heat xfer rate to incarease (+.25)

REFERENCE
Westinghouse Thermal/Hydraulic Principles II, pp 13-18/20

EPE-074; EK1.02(4.6/4.8)

ANSWER 1.13 (2.00)

a) Nuclear power is decreasing faster than turbine load, calling for a rods "out" to compensate exactly for the Tref-Tavg mismatch (+.75)

b) Steam pressure is periodically exceeding atmospheric steam dump setpoint because Tavg increased due to decreased heat removal (+.75) This causes steam flow oscillations and feed flow follows steam flow (+.25). The S/G oscillations are due to shrink and swell an the PORV opens and shuts. (+.25)

REFERENCE
SQN Transient Analysis by NRC TTC

001/000; K4.03(3.5/3.8) & 035/010; K1.09(3.8/4.0)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 1.14 (1.00)

p(i) = -.1(delta k/k) - .01(delta k/k) = -.11(delta k/k) (+.25)
k(i) = 1/(1-p(i)) = 1/(1-[-.11]) = .9009 (+.25)

p(f) = -.11 + .056 = -.054(delta k/k) (+.125)
k(f) = .949 (+.125)

Cf = Ci(1-k(i)/[1-k(f)] = 97 cps (+.25)

REFERENCE
SQN Reactor Physics review, pp 8-10

001/000. A1.06(4.1/4.4)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 2.01 (1.00)

d

REFERENCE
SQN Requal 1986, week 4, day 5, "rad monitors", pp 5

073/000; K6.01(2.2/2.4)

ANSWER 2.02 (1.00)

d

REFERENCE
FNP, RHR Lesson Plan, pp. 8 & 9
NA NCRODP 88.2, "RHR System"
SQNP lesson plan "RHR System" pp 5

005/000-K4.07 (3.2/3.5)

ANSWER 2.03 (1.00) Deleted

c

REFERENCE
Surry ND-88.4-LP-8, pp 8.6
Westinghouse Systems Manual, pp 4.5-20

028/000; K6.01(2.6/3.1)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 2.04 (2.00)

a) (1) 2B (+.33 ea)
(2) 1A
(3) 1B
b) (1) SI from Train 1A or 2A (+.2 ea for any 5)
(2) No blackout signal
(3) Transfer switch on swgr in Normal
(4) KA selected for operation
(5) Pump RA not running
(6) CONTROL BOARD HANDSWITCH IN AUTO
(7) NO LOCKOUT
(8) CONTROL POWER AVAILABLE

REFERENCE
SQN Requal 1986 week 1, day 4, "ERCW", pp 4-9 ; SQN DWG 45N765-15

076/000; K1.01(3.4/3.3), K1.05(3.8/4.0), K1.19(3.6/3.7), K4.02(2.9/3.2)

ANSWER 2.05 (2.00)

-Mechanical Overspeed (+.4), manual reset (+.1)
-Electrical Overspeed (+.4), NO manual reset (+.1)
-Thermal Overload (+.4), manual reset (+.1)
-Steam Supply Transfer (+.4), NO manual reset (+.1)

REFERENCE
SQNP System Descrip. "AFW", pp 6

061/000; K4.07 (3.1/3.3)

ANSWER 2.06 (1.00)

a) 1500 psig (+/- 25 psig) (+.33 ea)
b) 180 psig (+/- 25psig)
c) 1250 psig (+35/-65 psig)

REFERENCE
SQN E-0, pp 3, Westinghouse Systems Manual, pp 4-1-33 ; TS 3.5.1.2

EPE-011; EK3.12(4.4/4.6)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 2.07 (1.50)

1) RWST level < 29% (+.5)
2) Containment sump level > 11.25%
3) SI signal present

REFERENCE
SQN "ECCS Review", pp 8

EPE-011; EK3.15(4.3/4.4)

ANSWER 2.08 (1.00)

1) Hot leg loop 1 (+.25 ea)
2) Hot leg loop 3
3) RHR upstream of HXers
4) Containment atmosphere

REFERENCE
SQN Requal 1986, week 4 day 1, "PASF", pp 4

ANSWER 2.09 (1.00)

-SI Pumps* (+.25 ea)
-ONE Centrifugal Charging Pump
-UHI Gags
-Cold leg Accumulator Isolation Valves*

* only 2 req'd (at .5 ea)

REFERENCE
SQNP System Descrip. "RCS", pp 9

010/000; K1.02 (3.9/4.1)

ANSWER 2.10 (1.50)

a) S/Gs #1 and 4 (+.5)
b) (Appendix R requirement) PORVs were inaccessible for fire in the West Valve Room (+.5)
Only 2 S/Gs are required for safe shutdown (+.5)

REFERENCE
SQN Requal 1986 week 2, day 1, "Major Modifications", pp 5

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

035/010; K4.05(3.1/3.4)

ANSWER 2.11 ~~(1.50)~~ ~~(1.375)~~ 1.25

a) demister>>>relative humidity heater>>>prefilter bank>>>HEPA filter bank >>>Carbon adsorber bank>>>~~electric heating element~~>>~~carbon adsorber bank~~>>>HEPA filter bank (+.125 ea)
b) Two cross over air flow ducts draw air from the active air cleanup unit (+.5)

REFERENCE
SQNP Sys Descrip. 4.4, "Containment Air Purif and Cleanup System" pp 7-8

027/000; A2.01 (3.0/3.3)

ANSWER 2.12 (1.50)

SUMP via 63-72 to suction of A RHR pump thru A RHR HX (+.5) and either to 63-8>>>63-6(7)>>SI pump suction (+.25) or 63-172 to loops 1 and 3 (+.25) after the SI pump>>63-156 to hot legs ~~2~~ 1 and ~~4~~ 3 (+.5)

REFERENCE
SQN ES-1.3

EPE-011; EX3.08(3.9/4.1)

ANSWER 2.13 (1.50)

a) Prevent overheating turbine blading due to low steam flow (+.5 ea)
b) Prevent reaching the overvoltage/underfrequency setpoint on the mainbank transformers.
c) Prevent excessive load on EHC pump due to trying to pump heavy fluid.

REFERENCE
SQN GOI-2, pp 3-5; SQN GOI-2 "Plant Startup", pp 7/8

045/050; PWG-7(2.9/3.3)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 3.01 (1.00)

a

REFERENCE
SQN Requal 1986 week 2, day 1, "Major Modifications", pp 8/9

061/000; K4.04(3.1/3.4)

ANSWER 3.02 (1.00)

d.

REFERENCE
SQN Requal 1986 Week 5/6, day 7, "Control System Theory"
202002 K4.08 3.3/3.4
5.03 2.4/2.4

ANSWER 3.03 (1.25)

The stationary and movable grippers energize and the lift coil deenergizes (+.75); ROD URGENT FAILURE Alarm and red lamp at power cabinet actuate(+.5)
or urgent failure lamp on logic cabinet (for 2 of 3)

REFERENCE
SQN "Rod Control System", pp 12

001/050;A2.01(3.7/3.9)

ANSWER 3.04 (1.50)

a) Arm and actuate
b) Arm and actuate
c) Arm only

REFERENCE
Farley SD, "Steam Dump System", pp 23-28
SQNP System Descrip. "Steam Dump System", pp 6-8

041/020; K4.11 (2.8/3.1) & K4.14 (2.5/2.8) & K4.17 (3.7/3.9)]

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 3.05 (.50)

FALSE ~~true~~ (+.5)

REFERENCE
SQN "Excore NIs", pp 18

015/000; 6.04(3.2/3.4)

ANSWER 3.06 (1.50)

a) Output remains at the low end of the gain (+.5 ea)
b) 0 degree mismatch
c) Goes high to 72 steps per minute

REFERENCE
SQN Requal 1986, week 3, day 4, "Instrument Failures"; "Rod Control"

001/000; K4.03(3.5/3.8)

ANSWER 3.07 (1.50)

for any 4 ✓
-Phase A Containment Isolation signal from either Unit (+.375 ea)
-High Radiation signal from fuel handling bldg area rad monitors
- " " " " Aux Bldg exhaust vent rad monitors
-High Temperature in Aux Bldg Supply Fan Suction

This can be split into
RM-90-102 → TRN A
RM-90-103 → TRN B

REFERENCE
SQNP Sys Descr. 4.4, "Cont Air Purif and Cleanup Sys" pp 15
SQN DWG 45N630-4

EPE-060; PWG-10 (4.1/4.4)

ANSWER 3.08 (1.50)

Tavg; PZR Pressure; Delta Flux; Delta T at rated power;
Tavg at rated power (+.3 ea)

REFERENCE
Westinghouse PWR Systems Manual "RPS", pp 9-10
SQNP TS Table 2.2-1

012/000; K6.11 (2.9/2.9) & A2.05 (3.1/3.2)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 3.09 (1.75)

Hi-Hi containment pressure > 2.81 psig (+.5)
High Steam Line Flow Coincident with Low Steam Line Pressure <600 psig or Lo-Lo Tavg <540 deg F. (+.75)
High Steam Flow setpoint is at 40% flow from 0-20% load (+.25) then linearly from 40-110% flow from 20-100% load (+.25)

REFERENCE
SQNP PLS pp 9-11

013/000; K4.03 (3.9/4.3)

ANSWER 3.10 deleted (1.50)

1) Open CCW pump breaker (+.3 ea)
2) Reset SI
3) Reset EDG lockout
4) Start EDG
5) Manually load equipment

REFERENCE
SQN ELEDST

EPE 055; EA2.06(3.7/4.1), PWG-11(4.3/4.4)

ANSWER 3.11 (2.50)

a) Pzr level Hi-Low Alarm (+.25 ea)
   Charging Flow increases
   Level increases to 60% (Limited to 100% power program)
b) One Ltdn isolation valve shuts
   All orifice valves shut
   Pzr Level Low, Htrs Off, Ltdn Secured alarm
   Heaters turn off
   Level rises as charging flow reduced to flow through seals
   Pzr level Hi/ BU htrs on alarm
   Rx trip on high level

REFERENCE
Sqn Requal 1986 week 3, day 4, "Instrument Failures", pp 31/34

011/000; K1.01(3.6/3.9), A2.11(3.4/3.6)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 3.12 (1.00)

Turbine Trips (+.5) due to 2/4 OTDelta T logic being made up (+.5)
(Rx trip>>>>Turbine trip)

REFERENCE
TPT DWG 5610-T-D-14
SQN LESSON PLAN "TURBINE CONTROL", PP 19/20
012/000; PWG-10(4.4/4.7)

ANSWER 3.13 (1.50)

2/3 relays < 95% for 10 seconds if an signal present (+1.0)
for 5 minutes without SI(+.5)

REFERENCE
SQN "Diesel Generators", pp 13

062/000; K3.02(4.1/4.4)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 4.01 (1.00)

b

REFERENCE
SQN AOI-34A, pp 1

EPE-024; EK3.01(4.1/4.4)

ANSWER 4.02 (1.00)

d

REFERENCE
SQN LER 85-040-000; SQN "RHR", pp 13

005/000; PWG-7(3.5/3.8)

ANSWER 4.03 (1.00)

e

REFERENCE
FR-Z.2

EPE-069; EK3.01(3.8/4.2)

ANSWER 4.04 (1.00)

b

REFERENCE
Westinghouse Users Guide, pp 2-5

PWG-22(4.2/4.2)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 4.05 (1.00)

c or b

REFERENCE
SQN AOI-21.7, pp 1

EPE-058; PWG-10(4.1/4.2)

ANSWER 4.06 (.50)

false (+.5)

REFERENCE
SQN FR-S.1, step 3

EPE-029; PWG-11(4.5/4.7)

ANSWER 4.07 (1.00)

a) True (+.5 ea)
b) False

REFERENCE
Westinghouse User's Guide, pp 5, 17, 18

PWG-22(4.3/4.3)

ANSWER 4.08 (1.00)

a) True (+.5 ea)
b) False

REFERENCE
SQN RCI-1, pp 2,10

PWG-15(3.4/3.9)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 4.09 (1.00)

4, 1, 3, 5, 2 (-.2 for each swap required to put in correct order)

REFERENCE
SONP SOI-85.1A, pp 3

001/010; A4.01 (3.7/3.4)

ANSWER 4.10 (.75)

1) ASE (+.25 ea) for any 3)
2) Outage Coordinator
3) Other SEs assigned to the shift
4) Chickamauga load Dispatcher

REFERENCE
SON AI-3, pp 2

PWG-14(3.6/4.0)

ANSWER 4.11 (2.25)

-Verify steam stops closed (+.25 ea) see replacement
-Verify AFW pumps running and flow established
-Verify PZR pressure within 1900-2235
-Verify PZR level within 24-60%
-Verify Tavg controlling at 547 degrees
-Verify containment pressure and temperature normal
-Verify generator breakers open and 6.9 KV unit station service xferred
-Verify Main feed isolation
-Verify main feed pumps tripped

REFERENCE
SON AOI-27A, pp 1/2

EPE-069; PWG-11(4.5/4.5)

REPLACEMENT QUESTION FOR RO REPLACEMENT 4.16
SRO REPLACEMENT 7.16
RO REQUAL 4.11
SRO REQUAL 7.10

a) DESCRIBE THE BASIC STEPS INVOLVED IN CLOSING ALL 4 MSIV's AFTER A CONTROL ROOM EVACUATION HAS BEEN INITIATED. ASSUME THE OPERATOR HAS NOT LEFT THE CONTROL ROOM, AND THAT THE TURBINE AND REACTOR HAVE ALREADY BEEN TRIPPED. (1.0)

b) WHAT 3 ITEMS DOES AOI-27A, "CONTROL ROOM INACCESSIBILITY" REQUIRE/RECOMMEND THE OPERATORS TAKE WITH THEM TO THE AUXILIARY CONTROL ROOM FOR USE AS REFERENCE MATERIAL? (1.0)

ANS: a) LOWER S/G PORV setpoint until PORVs open (+.33ea)
Manually close dumps
simultaneously close all 4 MSIVs

b) EOIs (+.33 ea)
FRGs
Flow/Elect. Prints as needed

Ref: SQN AOI-27A pp2

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 4.12 (2.00)

a) -Close MSIVs and bypasses (+.5 ea)
-TRip turbine from main turbine front standard
-Stop and pull-to-lock both EHC pumps at the pump control station
b) (1) Verify PORV and block valves open (+.25 ea)
(2) Verify containment purge air exhaust isloated

REFERENCE
FR-S.1

EPE-029; PWG-11(4.5/4.7)

ANSWER 4.13 (1.50)

1) Visual inspection of breaker position (+.3 ea for any 5)
2) Breaker light indication
3) Functional Test (eg. voltmeter)
4) Local (or Remote) Instrumentation
5) Annunciators
6) Switch position

REFERENCE
TPT AP 031, pp 8
SDN (CAF)

PWG-13: Conduct/Verify Valve Lineups(3.7/4.0)

ANSWER 4.14 (1.00)

This allows S/G Pressure protection without having to depend on the code safeties (+.75) which could lift and not reseat causing an unisolable steam leak(+.25)

REFERENCE
Westinghouse Background Document; (TPT OBNK E-16)

EPE-038; EK3.06(4.2/4.5)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 4.15 (1.00)

1) (Promote thermal stratification) so ruptured S/G doesn't depressurize during cooldown (+.5 ea for any 2)
2) Ensures S/G available as a heat sink if required
3) Iodine scrubbing of incoming RCS fluid

REFERENCE
Westinghouse ERG Background Document; (TPT QBNK 18)

EPE-038; EK3.06(4.2/4.5)

ANSWER 4.16 (1.00)

Adequate seal film (+.5)
Clogging of the seal (+.5)

REFERENCE
SQN AOI-23, pp 6

003/000; A2.01(3.5/3.9)

NRC MASTER

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR REQUALIFICATION EXAMINATION

FACILITY: SEQUOYAH 1&2

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 86/12/15

EXAMINER: DEAN, W M

CANDIDATE: _____

INSTRUCTIONS TO CANDIDATE:

Read the attached instruction page carefully. This examination replaces the current cycle facility administered requalification examination. Retraining requirements for failure of this examination are the same as for failure of a requalification examination prepared and administered by your training staff. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up four (4) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
18.50	~~25.51~~ 26.2	_____	_____	5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
~~18.00~~ 16.25	~~24.83~~ 23.1	_____	_____	6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
~~18.00~~ 17.75	~~24.83~~ 25.2	_____	_____	7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
18.00	~~24.83~~ 25.5	_____	_____	8 ADMIN PROCEDURES, CONDITIONS, LIMITATIONS
~~72.50~~ 70.5		_____		Totals
		Final Grade		

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

_____
Candidate's Signature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

3. Use black ink or dark pencil only to facilitate legible reproductions.

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

5. Fill in the date on the cover sheet of the examination (if necessary).

6. Use only the paper provided for answers.

7. Print your name in the upper right-hand corner of the first page of each section of the answer sheet.

8. Consecutively number each answer sheet, write "End of Category __" as appropriate, start each category on a new page, write only on one side of the paper, and write "Last Page" on the last answer sheet.

9. Number each answer as to category and number, for example, 1.4, 6.3.

10. Skip at least three lines between each answer.

11. Separate answer sheets from pad and place finished answer sheets face down on your desk or table.

12. Use abbreviations only if they are commonly used in facility literature.

13. The point value for each question is indicated in parentheses after the question and can be used as a guide for the depth of answer required.

14. Show all calculations, methods, or assumptions used to obtain an answer to mathematical problems whether indicated in the question or not.

15. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK.

16. If parts of the examination are not clear as to intent, ask questions of the examiner only.

17. You must sign the statement on the cover sheet that indicates that the work is your own and you have not received or been given assistance in completing the examination. This must be done after the examination has been completed.

18. When you complete your examination, you shall:

a. Assemble your examination as follows:

(1) Exam questions on top.

(2) Exam aids - figures, tables, etc.

(3) Answer pages including figures which are part of the answer.

b. Turn in your copy of the examination and all pages used to answer the examination questions.

c. Turn in all scrap paper and the balance of the paper that you did not use for answering the questions.

d. Leave the examination area, as defined by the examiner. If after leaving, you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION 5.01 (1.50)

Indicate whether the following will cause the power range instrument to be indicating HIGHER, LOWER or the SAME as actual power, if the instrument has been adjusted to 100% based on a calculated calorimetric.

a. If the feedwater temperature used in the calorimetric was higher than actual feedwater temperature.

b. If the reactor coolant pump heat input used in the calorimetric is omitted.

c. If the steam flow used in the calorimetric was lower than actual.

QUESTION 5.02 (1.00)

The reactor is critical at 10,000 cps when a S/G PORV fails open. Assuming BOL conditions, no rod motion, and no reactor trip, choose the answer below that best describes the values of Tavg and nuclear power for the resulting new steady state. (POAH = point of adding heat).

a. Final Tavg greater than initial Tavg, Final power above POAH.

b. Final Tavg greater than initial Tavg, Final power at POAH.

c. Final Tavg less than initial Tavg, Final power at POAH.

d. Final Tavg less than initial Tavg, Final power above POAH.

QUESTION 5.03 (1.00)

Attached Figure # 219 shows a power history and four possible xenon traces (reactivity vs time). Select (a, b, c, or d) the curve that correctly displays the expected xenon transient for the given power history.

QUESTION 5.04 (1.00)

For the Cycle 4 core, what is the main core design reason that the pellet swell and clad creep effects override the Pu-240 buildup/U-238 depletion effects and make the Doppler Only Power Coefficient less negative?

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.05 (1.50)

An ECC is calculated for a startup following a reactor trip from 50% power equilibrium xenon(BOL). Indicate if the actual critical rod position will be HIGHER, LOWER or the SAME from the calculated position for each of the following situations. Use attached curves as appropriate and treat each case individually.

a) Xenon reactivity curve for trip from 100% is used to calculate conditions to startup 20 hours after the trip.

b) Boron worth at EOL is used vice BOL worth. (Dilution is required to reach desired Boron concentration in both cases)

c) The EOL critical Boron Concentration is used instead of the BOL critical Boron concentration.

QUESTION 5.06 (1.50)

Unit 1 is at 90% power with control rods in MANUAL when the turbine is ramped down to 60%. Indicate whether the parameters below will increase, decrease or remain the same during both the initial response (first 30 seconds of the transient) and after turbine power has stabililzed relative to the initial conditions. (Assume the following: No changes to boron/xenon
Loop transport time is 10 seconds
No operator actions)

NOTE: No answer required where it is already filled in below.

	Initial Response	Steady State
a) S/G Pressure		NO ANSWER RQRD
b) Reactor Power	NO ANSWER RQRD	
c) Tcold		
d) Tavg		

QUESTION 5.07 (1.00)

What two fuel rod related parameters, excluding power limitations, should be maintained within limits to minimize cladding stress and strain? (setpoints not required)

QUESTION 5.08 (1.50)

List the three main sources of fission neutrons in the core at end of life and indicate their approximate contribution (in %) to power.

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.09 (1.00)

What is the reason that Tech Specs allow up to two hours of operation with a Quadrant Power Tilt Ratio in excess of 1.02?

QUESTION 5.10 (2.00)

a. During natural circulation, EXPLAIN how it is possible to form a bubble in the reactor vessel head when indications show that the RCS is subcooled?

b. How will pressurizer level respond, (INCREASE,DECREASE, or REMAIN THE SAME) if the backup heaters are energized with a bubble in the reactor vessel head? Assume normal pressurizer level and briefly EXPLAIN your answer.

QUESTION 5.11 (1.00)

The attached figure shows the change in pressure across a pressurizer PORV and its associated upstream and downstream piping for various valve positions. EXPLAIN why the major pressure drop occurs in piping segment P1-P2 when the valve is slightly open, whereas the major pressure drop occurs in piping segment P2-P4 by the time the valve is fully open.

QUESTION 5.12 (1.50)

Assume the plant is at a steady state power level of 75%, with rod control in MANUAL and the plant in BOL, when a 15% step increase in turbine load occurs. DESCRIBE and EXPLAIN the behavior of the following parameters during the first several minutes of the transient. Assume MTC is -3 pcm/F and NO RX TRIP occurs.

a) Tstm
b) margin to DNB

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.13 (1.50)

a) Why is 2200 degrees F given as the 10CFR50 peak cladding limitation during an accident condition? (0.5)

b) The Tech Spec limit on F(n)Delta h is 1.49[1.0 + .3(1-P)] where P represents fraction of rated power. Why does this limit increase as power decreases for a given RCS flow rate? (1.0)

QUESTION 5.14 (1.50)

Attached is a typical boiling curve for water as it approaches, then exceeds, the DNB point. What are the thermodynamic conditions that cause:

a) The decrease in heat transfer rate in Region III?

b) The increase in heat transfer rate in Region IV?

(***** END OF CATEGORY 05 *****)

QUESTION 6.01 (1.00)

Which one of the following describes how the AFW system is prevented from feeding a faulted S/G?

a) Operator action is required to isolate AFW when a faulted S/G is detected.

b) Pressure switches on the AFW discharge lines will automatically close the loop level control valves when low AFW discharge pressure is detected.

c) Level transmitters on the S/G wide range level instrument will automatically close the loop level control valve when a low level is detected in a S/G.

d) Flow transmitters on the AFW discharge lines will automatically close the loop level control valves when excessive flow is detected in AFW discharge piping.

QUESTION 6.02 (1.00)

RHR inlet isolation valves 74-1 and 74-2 each have an independent RCS pressure transmitter associated with them. Which of the following statements describing the effects of the transmitter associated with 74-1 failing high is correct?

a. If both 74-1 and 74-2 are open, they will shut.

b. If open, 74-1 will shut and if closed, 74-2 will not be able to be opened.

c. If both 74-1 and 74-2 are shut, neither one will be able to be opened.

d. If open, 74-1 will shut, but 74-2 can be positioned as desired.

e. 74-1 can be positioned as desired by the operator, but 74-2 will not be able to be opened if it is shut.

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.03 (1.50)

Indicate whether the following situations will ARM ONLY, ARM AND ACTUATE or HAVE NO EFFECT on the steam dump system.

a) 80% power, 7.5%/min ramp decrease in turbine load for 3 minutes, Tavg>Tref by 7 degrees F, steam dumps in Tavg mode of operation

b) Hot Zero Power, Tavg=549 degrees F, steam dumps in STM PRESS mode with 1005 psig set into the steam pressure controles, ~~steam dumps in Tavg mode.~~

c) Turbine trip, Tavg=542 degrees, steam dumps in Tavg mode

QUESTION 6.04 (1.50)

Fill in the blanks in the statement below concerning the Containment Air Return System:

Both fans are actuated upon an _____ actuation signal but are delayed starting for _____ minutes. They continuously draw air from the dome of the containment vessel and from the following pocketed spaces _____, _____, _____ and _____.

QUESTION 6.05 (1.00)

What are the 5 analyses that can be performed online by the Post Accident Monitoring System?

QUESTION 6.06 (1.50)

What 4 signals will automatically initiate the operation of the Auxiliary Building Gas Treatment System?

QUESTION 6.07 (1.50) Deleted

An SI signal was generated due to a transient caused by an undervoltage condition on the 2A-A 6.9KV Bus. During this transient, the 2A CHG Pump breaker stayed closed causing an EDG lockout.(all other loads were removed) What 5 actions must the operator take to load equipment on that bus using the 2A-A EDG?

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.08 (2.50)

Describe all events/alarms that occur due to the following instrument failures until the reactor either trips or stabilizes. Assume no operator actions and all controls are in automatic.

a) Pressurizer Level Reference Signal (Tavg) fails high while at 50% power. (0.75)

b) Selected Secondary Pressurizer Level Control Channel signal fails low while at 70% power. (1.75)

QUESTION 6.09 (1.00)

a) What is the damage that the exciter field breaker Volts/Hertz relay (59/81) is designed to protect against?

b) What actions occur (include time delays) if this relay operates? (Only discuss the 59/81 relay with the low setpoint)

QUESTION 6.10 (1.50)

Recent modifications to the S/G PORVs added manual operator extensions for remote operation of the valves on 2 S/Gs.

a) Which 2 S/Gs were affected by this modification? (0.5)

b) What is the basis for this modification? (Include discussion of why only 2 S/G PORVs were modified)

QUESTION 6.11 ~~(1.50)~~ (1.375)

a) Describe the order of processing elements in the Air Cleanup Units through which air is drawn by the Air Cleanup Subsystem. ~~(1.00)~~ (.875)

b) How are the processing elements in an INACTIVE air cleanup unit loaded with radioactive material kept cool? (0.5)

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.12 (1.00)

While transfering a new fuel assembly from the upender to the core, the Dillon Cell fails high. What actions must the operator take to disengage the gripper from the fuel when the assembly is properly placed in the core? (Include location of any controls/components operated)

QUESTION 6.13 (1.50)

Describe Both of the flow paths for hot leg recirculation, from the recirculation sumps to the RCS. Identify major components and any valves which can be operated from the control room. (Use only the A Train)

(***** END OF CATEGORY 06 *****)

QUESTION 7.01 (1.00)

Which one of the following situations does NOT require emergency boration per ADI-34.A, "Emergency Boration"?

a) One rod stuck in the fully withdrawn position following a rx trip.

b) ROD BANK D LOW LIMIT alarm actuates as rods are driving in automatically.

c) A steady, sustained increase in source range counts with keff=.95 with no rod motion or planned dilution in progress.

d) RCS Tavg falls below 525 degrees at a rate of 30 degrees/hr after a reactor trip. (No manual cooldown in progress)

QUESTION 7.02 (1.00)

Which one of the following conditions are the correct MINIMUM requirements for starting "B" RHR pump while swapping RHR pumps during normal MODE 5 operations?

	Pump A status	RCS Level
a)	On	695'
b)	Off	695'
c)	On	695' 6"
d)	Off	695' 6"
e)	On	696'

QUESTION 7.03 (1.00)

Which one of the following is addressed in FR-Z.2, "Containment Flooding", as a potential source of excessively high containment sump levels?

a) Condensed steam from a steam break
b) RCS water from a LOCA
c) RWST
d) Accumulators
e) CCW

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.04 (1.00)

The loss of which one of the following 125 VDC Vital Battery Boards will cause a reactor trip and also number 2/4 S/G MSIVs and main feed regulating bypass valves to close?

a) Unit 2, Board I
b) Unit 1, Board II
c) Unit 2, Board III
d) Unit 1, Board IV

QUESTION 7.05 (.50)

TRUE or FALSE: The turbine should be tripped as an immediate action if the reactor trip breakers fail to open upon a legitimate trip signal.

QUESTION 7.06 (1.00)

Indicate whether each of the following statements regarding EOP usage is TRUE or FALSE:

a) If an expected response of an EOP can NOT be verified and the Response Not Obtained action can NOT be performed, the operators may continue with the procedure.

b) If a task is in progress when a transition to another procedure takes place, that task need NOT be completed.

QUESTION 7.07 (2.00)

List, in their order of preference, the four recovery techniques stated in FR-C.1, "Inadequate Core Cooling".

QUESTION 7.08 (1.50)

AOI-29, "Dropped or Damaged Fuel Assembly", discusses the "Worst Case" event of a dropped and damaged fuel assembly. What are the 3 criteria, that if met, could result in a radioactive release high enough to require implementation of the REP? (ie. the worst case)

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.09 (.75)

Aside from the on-shift SE (Shift Engineer), what other 3 personnel may authorize clearances at Sequoyah Nuclear Plant?

QUESTION 7.10 ~~(2.25)~~ (2.00) see replacement question

What are all the immediate actions/verifications if there is a need to evacuate the control room due to the presence of smoke in the control room? Assume the reactor and turbine have been tripped already.

QUESTION 7.11 (1.00)

Why is the S/G atmospheric PORV NOT isolated while performing E-3, "SGTR", but is only verified shut < 1040 psig and that its controller is in AUTO?

QUESTION 7.12 (1.00)

EOP E-3, "SGTR", requires the operator to maintain AFW flow to the ruptured S/G until narrow range level is established. Provide two reasons for this procedural requirement.

QUESTION 7.13 (1.50)

The Response Not Obtained for step 1 of FR-H.1, "Response to Loss of Secondary Heat Sink" states: If ALL S/G Wide Range levels < 25%, then STOP ALL RCPs and immediately initiate feed and bleed per steps 11 to 13. Why are the RCPs tripped prior to inititing feed and bleed, aside from the fact that heat input from the pumps will be removed?

QUESTION 7.14 (1.00)

What is the major ADVANTAGE and the major DISADVANTAGE of using ES-3.3, "Post SGTR Cooldown by Ruptured S/G Depressurization"?

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

REPLACEMENT QUESTION FOR RO REPLACEMENT 4.16
SRO REPLACEMENT 7.16
RO REQUAL 4.11
SRO REQUAL 7.10

a) DESCRIBE THE BASIC STEPS INVOLVED IN CLOSING ALL 4 MSIV's AFTER A CONTROL ROOM EVACUATION HAS BEEN INITIATED. ASSUME THE OPERATOR HAS NOT LEFT THE CONTROL ROOM, AND THAT THE TURBINE AND REACTOR HAVE ALREADY BEEN TRIPPED. (1.0)

b) WHAT 3 ITEMS DOES AOI-27A, "CONTROL ROOM INACESSIBILITY" REQUIRE/RECOMMEND THE OPERATORS TAKES WITH THEM TO THE AUXILIARY CONTROL ROOM FOR USE AS REFERENCE MATERIAL? (1.0)

QUESTION 7.15 (1.50)

AOI-23, "RCP Seal Abnormalities", states that the #2 seal should last 24 hours under full system pressure. Why then does this procedure require shutdown of an RCP within 30 minutes of shutting the #1 seal leak-off valve?

(***** END OF CATEGORY 07 *****)

QUESTION 8.01 (1.00)

When would an injured worker with contamination be considered an Unusual Event?

a. If the worker is sent home.

b. If the worker is transported to an offsite hospital.

c. If the contamination is internal.

d. If in addition to being contaminated, the worker's exposure is above the 10CFR20 quarterly limit.

QUESTION 8.02 (1.00)

Which of the following conditions requires action according to Tech Specs in less than 1 hour if in Mode 2 on Unit 1?

a. The shutdown margin is 1.8.

b. One Boric Acid Transfer pump is inoperable.

c. One Shutdown rod not fully withdrawn.

d. Primary Containment average air temperature is 140 deg. F. in the lower compartment.

QUESTION 8.03 (1.00)

True or False:

a. Rad Tumbler Sets are installed on doors leading directly to high radiation areas but not exceeding 1000 mr/hr.

b. The Plant Health Physicist controls the keys to the Rad Security Locks.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.04 (1.50)

True or False:

a. Category "B" SOI's do NOT require the maintenance of the system status file since Category "B" SOI's may not change a system's status.

b. Category "A" SOI's are NOT required to be present for performing tasks of a frequent or routine nature.

c. Valve and Power Availibility Checklists contained within SOI's are NOT categorized as "A" or "B"; therefore they SHOULD be present during checklist performance.

QUESTION 8.05 (.50)

Fill in the blank:

According to AI-2, Authorities and Responsibilities For Safe Operation and Shutdown of Sequoyah Nuclear Plant, in the event of a reactor trip or an unexplained power reduction, it is the responsibility of the _____ to analyze the cause and determine that operations can continue safely before returning the reactor to power.

QUESTION 8.06 (1.50)

List FIVE parameters/systems/conditions that have Tech Spec LCO's based upon 10CFR100, Reactor Site Criteria.

QUESTION 8.07 (2.00)

8 OF WHICH 3 CONSIST OF UNIT 1 AND UNIT 2 PARAMETERS.

List the parameters needed to calculate a total plant noble gaseous radiation release rate per TI-30.

QUESTION 8.08 (1.00)

In accordance with AI-3, Clearance Procedure, state whose instructions must be obtained prior to the operation of equipment or controls tagged with a blue operating permit tag.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.09 (1.00)

a. What procedure is used to determine the classification of an emergency?

b. According to the REP, which emergency classification level has as one of its purposes to "initiate predetermined actions for the public?"

QUESTION 8.10 (1.50)

What are the three boron injection flow paths that can be considered to meet the requirements of Tech Spec 3.1.2.2 (attached)?

QUESTION 8.11 (1.00)

According to Tech Spec 6.7, Safety Limit Violation, what two actions must take place within one hour in the event a Safety Limit is violated?

QUESTION 8.12 (1.00)

During Mode 1 operation of unit 1 it is found that 2 of 4 channels for Pressurizer Pressure High Reactor trip are inoperable due to a generic material deficiency (repair time 14 days). Using Tech Spec LCO's provided, determine what actions must be taken as a result of this failure? State specific LCO/action steps which apply.

QUESTION 8.13 (1.00)

What is the basis for the upper limit of containment temperature?

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.14 (2.00)

If an MR (maintenance request) made a Temporary Alteration to inoperable CSSC (Critical Systems, Structures, and Components) equipment, what must be done (administratively) if the Temporary Alteration must remain in effect after completion of the MR? Include in your explanation any review/approval cycles or other administrative steps as appropriate.

QUESTION 8.15 (1.00)

With reactor power above 50% and AFD within the "doghouse" limits (Tech Spec figure 3.2-1; AFD limits as a function of rated thermal power):

What operator action is required by Tech Specs 3/4.2.1 (Axial Flux Difference) if the AFD monitor alarm becomes inoperable?

(***** END OF CATEGORY 08 *****)
(********** END OF EXAMINATION **********)

SWER 5.01 (1.50)

a. ~~Higher~~ LOWER (+.5 ea)
b. ~~Lower~~ HIGHER
c. ~~Higher~~ LOWER

REFERENCE
NUS Vol 4, pp 2.2-4

015/000; A1.01(3.5/3.8)

ANSWER 5.02 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, Section I-5, MTC and Power Defect
DPC, Fundamentals of Nuclear Reactor Engineering
St Lucie Reactor Physics, Section 7.6 & 7.7

039/000; A2.05(3.3/3.6)

ANSWER 5.03 (1.00)

b

REFERENCE
EIH: GPNT,Vol VII, Chapter 10.1-83-86
BSEP: L/P 02-2/3-A, pp 172 - 176; 02-0G-A, pp 57 - 60
Westinghouse Nuclear Reactor Theory, pp. I-5.77 - 79
Turkey Point, Reactor Core Control, pp. 4-24 - 28

001/000-K5.13 (3.7/4.0)

NRC

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 5.01 (1.50)

a. ~~Higher~~ LOWER (+.5 ea)
b. ~~Lower~~ HIGHER
c. ~~Higher~~ LOWER

REFERENCE
NUS Vol 4, pp 2.2-4

015/000; A1.01(3.5/3.8)

ANSWER 5.02 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, Section I-5, MTC and Power Defect
DPC, Fundamentals of Nuclear Reactor Engineering
St Lucie Reactor Physics, Section 7.6 & 7.7

039/000; A2.05(3.3/3.6)

ANSWER 5.03 (1.00)

b

REFERENCE
EIH: GPNT,Vol VII, Chapter 10.1-83-86
BSEP: L/P 02-2/3-A, pp 172 - 176; 02-0G-A, pp 57 - 60
Westinghouse Nuclear Reactor Theory, pp. I-5.77 - 79
Turkey Point, Reactor Core Control, pp. 4-24 - 28

001/000-K5.13 (3.7/4.0)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 5.04 (1.00)

(A low leakage loading pattern has been employed which places) new fuel assemblies loaded in the center of the core (+~~.25~~ 1.0). (These assemblies see a higher flux for a longer period (+~~.25~~), accelerating the effects of pellet swell and clad creep relative to earlier cycles (+~~.25~~))

REFERENCE
SQN Reactor Physics Review, pp 18/19

001/000; K5.49(3.4/3.7)

ANSWER 5.05 (1.50)

a) Lower (+.5 ea)
b) Lower
c) Higher

REFERENCE
ST Lucie OP 0030126 and Plant Curves
CNTO Reactor Core Control, Section 7

001/000; A2.07(3.6/4.2)

ANSWER 5.06 (1.50)

a) increase; (no answer) (+.25 ea response)
b) (no ans); decrease
c) increase; increase
d) increase; increase

REFERENCE
CNTO "Thermal/Hydraulic Principles II", pp 12-39-45

039/000; A2.05(3.3/3.6)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 5.07 (1.00)

1) Internal Fuel Rod Gas Pressure (+.5 ea)
2) Average Clad temperature

REFERENCE
SQN HCF review, pp 5

001/000; K5.46(2.3/3.6)

ANSWER 5.08 (1.50)

Pu-239 37% (+/-3) (+.3 for isotope, +.1 for %, +.1 for correct order)
U-235 35.5% --thermal fission
U-235 8% --fast fission OR U-235 43%
Pu-239 40%
U-238 8%

REFERENCE
SQN/WBN License Cert Trng, "Reactor Kinetics", pp 6
St Lucie Reactor Physics Section 7.6.7; SD 1, pp 33

001/000; K5.47 (2.9/3.4)

ANSWER 5.09 (1.00)

Allows for time to identify and correct a dropped or misaligned rod (+1.0)

REFERENCE
SQN TS B 3/4.2.4

EPE-003; PWG-5 (2.7/3.9)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 5.10 (2.00)

a. Subcooling is based on core exit T/Cs or hot leg RTD readings. During natural circulation the mass of metal in the head can retain heat and keep local temperatures above saturation. The temperature indicators would not reflect this local saturated condition. (1.0)

b. Pressurizer level decreases because the pressurizer pressure increase will compress the vessel void and force water out of the pressurizer. (1.0)

REFERENCE
G.P. Heat Transfer and FF Pp 355-358

EPE-074; EA2.05(3.4/4.2) & EA2.07(4.1/4.7)

ANSWER 5.11 (1.00)

When slightly open, the pressure drop is across the valve itself as there is isenthalpic expansion (+.5). As the valve is fully opened, head losses in the piping become more significant (+.5)

REFERENCE
Westinghouse Thermal/Hydraulic Principles, pp 10-71/73

010/000; K5.02(2.6/3.0)

ANSWER 5.12 (1.50)

a) Tstm will drop rapidly (+.25) as Tavg decreases in order to maintain the Delta T across the S/G tubes to provide the heat transfer to support 90% load demand (+.5)

b) Even though pressurizer pressure decreases and power increases, which decreases the margin to saturation, the large cooldown of the RCS (+.5) overcompensates for this and the margin to DNB increases (+.25)

REFERENCE
Westinghouse Transient and Accident Analysis

035/010; K1.09(3.8/4.0)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 5.13 (1.50)

a) prevent significant occurrence of zirc-water reaction (+.5)
b) as power drops, the enthalpy rise across the core will be less (+.25) with smaller enthalpy increase, the coolant is further from DNB, allowing a higher F(n) Delta h (+.75) (This allows changes in the radial power shape for all permissable rod insertion limits)

REFERENCE
SQN TS B3/4 2.2
Westinghouse Thermal/Hydraulic Principles II, pp 13-15/16

001/000; K5.46(2.3/3.6)

ANSWER 5.14 (1.50)

a) > DNB, have partial film boiling, where the fuel rod is alternately covered with steam and water (+.25). Steam has poor thermal conductivity capabilities (+.25), so heat transfer rate drops and Delta T rises (+.25)

b) As fuel surface temperatures rise, stable steam layer forms (+.25) causing a further increase in fuel rod temperatures (+.25). Eventually, significant radiative heat transfer occurs causing heat xfer rate to incarease (+.25)

REFERENCE
Westinghouse Thermal/Hydraulic Principles II, pp 13-18/20
SQN HTFF, PP 21-24
EPE-074; EK1.02(4.6/4.8)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 6.01 (1.00)

Q

REFERENCE
SQN Requal 1986 week 2, day 1, "Major Modifications", pp 8/9

061/000; K4.04(3.1/3.4)

ANSWER 6.02 (1.00)

d

REFERENCE
FNP, RHR Lesson Plan, pp. 8 & 9
NA NCRODP 88.2, "RHR System"
SQNP lesson plan "RHR System" pp 5

005/000-K4.07 (3.2/3.5)

ANSWER 6.03 (1.50)

a) Arm and actuate
b) Arm and actuate
c) Arm only

REFERENCE
Farley SD, "Steam Dump System", pp 23-28
SQNP System Descrip. "Steam Dump System", pp 6-8

041/020; K4.11 (2.8/3.1) & K4.14 (2.5/2.8) & K4.17 (3.7/3.9)]

ANSWER 6.04 (1.50)

Containment Hi-Hi pressure; 10; S/G enclosures; PZR enclosure; accumulator spaces; instrument room (+.25 ea)

REFERENCE
Westinghouse PWR Systems Manual, sect 4.5, pp 14

022/000; PWG-4 (3.5/3.8)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 6.05 (1.00)

1) Chloride concentration (+.2 ea)
2) pH
3) Dissolved O2
4) Entrained H2
5) Conductivity

REFERENCE
SQN Requal 1986 week 4, day 1, "PASF", pp 7

ANSWER 6.06 (1.50)

-Phase A Containment Isolation signal from either Unit (+.375 ea) for any 4
-High Radiation signal from fuel handling bldg area rad monitors
- " " " " Aux Bldg exhaust vent rad monitors
-High Temperature in Aux Bldg Supply Fan Suction

This can be split into
RM-90-102 → TRN A
RM-90-103 → TRN B

REFERENCE
SQNP Sys Descr. 4.4, "Cont Air Purif and Cleanup Sys" pp 15
SQN DWG 45N630-4
EPE-060; PWG-10 (4.1/4.4)

ANSWER 6.07 (1.50)

1) Open CCW pump breaker (+.3 ea)
2) Reset SI
3) Reset EDG lockout
4) Start EDG
5) Manually load equipment

Deleted

REFERENCE
SQN ELEDST

EPE 055; EA2.06(3.7/4.1), PWG-11(4.3/4.4)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 6.08 (2.50)

a) Pzr level Hi-Low Alarm (+.25 ea)
Charging Flow increases
Level increases to 60% (Limited to 100% power program)
b) One Ltdn isolation valve shuts
All orifice valves shut
Pzr Level Low, Htrs Off, Ltdn Secured alarm
Heaters turn off
Level rises as charging flow reduced to flow through seals
Pzr level Hi/ BU htrs on alarm
Rx trip on high level

REFERENCE
Sqn Requal 1986 week 3, day 4, "Instrument Failures", pp 31/34

011/000; K1.01(3.6/3.9), A2.11(3.4/3.6)

ANSWER 6.09 (1.00)

a) (Supersaturating cores causing high hysteresis losses) resulting in damage to generator and transformer windings from overheating (+.5)
b) -After 15 seconds, base adjust runs to AFNL (amps field no load) and the regulator is tripped off (+.25)
-30 seconds later(45 seconds), field breaker is tripped (if generator PCBs are open) and trips the turbine (+.25)

REFERENCE
Requal 1986 week 3, day 2, "Excitation System", pp 6-13

043/000; K6.02(1.7/1.9) Note: emphasized as a learning obj in requal

ANSWER 6.10 (1.50)

a) S/Gs #1 and 4 (+.5)
b) (Appendix R requirement) PORVs were inaccessible for fire in the West Valve Room (+.5)
Only 2 S/Gs are required for safe shutdown (+.5)

REFERENCE
SQN Requal 1986 week 2, day 1, "Major Modifications", pp 5

035/010; K4.05(3.1/3.4)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 6.11 (1.25) ~~(1.50)~~

a) demister>>>relative humidity heater>>>prefilter bank>>>HEPA filter bank >>>Carbon adsorber bank>>>~~electric heating element~~>>~~carbon adsorber bank~~>>HEPA filter bank (+.125 ea)

b) Two cross over air flow ducts draw air from the active air cleanup unit (+.5)

REFERENCE
SQNP Sys Descrip. 4.4, "Containment Air Purif and Cleanup System" pp 7-8

027/000; A2.01 (3.0/3.3)

ANSWER 6.12 (1.00)

-Operate the solenoid bypass switch to the "Bypass" position on the console (+.75) ~~(+.25 ea)~~

-Use the gripper control knob on the console to operate the gripper (+.25)

REFERENCE
SQN LP OPL271C014, SQN FHI 1-4A

034/000; PWG-6(2.7/3.3)

ANSWER 6.13 (1.50)

SUMP via 63-72 to suction of A RHR pump thru A RHR HX (+.5) and either to 63-8>>>63-6(7)>>SI pump suction (+.25) or 63-172 to loops 1 and 3 (+.25) after the SI pump>>63-156 to hot legs ~~2~~ 1 and ~~4~~ 3 (+.5)

REFERENCE
SQN ES-1.3

EPE-011; EX3.08(3.9/4.1)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 7.01 (1.00)

b

REFERENCE
SQN AOI-34A, pp 1

EPE-024; EK3.01(4.1/4.4)

ANSWER 7.02 (1.00)

d

REFERENCE
SQN LER 85-040-000; SQN "RHR", pp 13

005/000; PWG-7(3.5/3.8)

ANSWER 7.03 (1.00)

e

REFERENCE
FR-Z.2

EPE-069; EK3.01(3.8/4.2)

ANSWER 7.04 (1.00)

c or b

REFERENCE
SQN AOI-21.7, pp 1

EPE-058; PWG-10(4.1/4.2)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 7.05 (.50)

false (+.5)

REFERENCE
SQN FR-S.1, step 3

EPE-029; PWG-11(4.5/4.7)

ANSWER 7.06 (1.00)

a) True (+.5 ea)
b) False

REFERENCE
Westinghouse User's Guide, pp 5, 17, 18

PWG-22(4.3/4.3)

ANSWER 7.07 (2.00)

these positions could be switched

1) Increase Injection Flow (+.3 for technique, +.2 for position)
2) Depressurize S/Gs
3) Start RCPs
4) Open RCS vent paths(PORVs)

REFERENCE
FR-C.1; (TPT QBNK H-5)

EPE-074; EK1.03(4.5/4.9)

ANSWER 7.08 (1.50)

1) ~~< 100 hours after shutdown~~ accept reasonable answer causing worst case fuel damage release (+.5 ea) ; if this is not referred to as refueling does not occur until after 100 hours.
2) Assembly from the highest core power region
3) All fuel rods damaged

REFERENCE
SQN AOI-29, pp 5, 8 ; SQN TS 3.9.3

EPE-036; EK3.03(3.7/4.1)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 7.09 (.75) for any 3

1) ASE (+.25 ea)
2) Outage Coordinator
3) Other SEs assigned to the shift
4) Chickamauga Load Dispatcher

REFERENCE
SQN AI-3, pp 2

PWG-14(3.6/4.0)

ANSWER 7.10 (2.0) ~~(2.25)~~

-Verify steam stops closed (+.25 ea)
-Verify AFW pumps running and flow established
-Verify PZR pressure within 1900-2235
-Verify PZR level within 24-60%
-Verify Tavg controlling at 547 degrees
-Verify containment pressure and temperature normal
-Verify generator breakers open and 6.9 KV unit station service xferred
-Verify Main feed isolation
-Verify main feed pumps tripped

a) - Lower Sp PORV (+.33 ea)
Setpt till PORV is open
- Manually close dumps
- Close all MSIVs simultaneously

b) EOIs (+.33ea)
FRGs
Flow/Elec Prints as needed

REFERENCE
SQN AOI-27A, pp 1/2

EPE-069; PWG-11(4.5/4.5)

ANSWER 7.11 (1.00)

This allows S/G Pressure protection without having to depend on the code safeties (+.75) which could lift and not reseat causing an unisolable steam leak(+.25)

REFERENCE
Westinghouse Background Document; (TPT QBNK E-16)

EPE-038; EK3.06(4.2/4.5)

ANSWERS -- SEQUOYAH 1&2 -86/12/15-DEAN, W M

ANSWER 7.12 (1.00)

1) (Promote thermal stratification) so ruptured S/G doesn't depressurize during cooldown (+.5 ea for any 2)
2) Ensures S/G available as a heat sink if required
3) Iodine scrubbing of incoming RCS fluid

REFERENCE
Westinghouse ERG Background Document; (TPT QBNK 18)

EPE-038; EK3.06(4.2/4.5)

ANSWER 7.13 (1.50)

RCPs will keep 2 phase flow mixture (+.75) and the PORVs will not be able to release as much steam (energy) (+.75)
OR - HIGHER PRESSURE WILL REDUCE SI FLOW (+.75) AND INCREASE INVENTORY LOSS OUT PORVs (+.75)

REFERENCE
Westinghouse background document

EPE-074; EK3.08(4.1/4.2)

ANSWER 7.14 (1.00)

1) Faster cooldown (+.5 ea)
2) Maximum radiological release

REFERENCE
SON ES-3.1, pp 10

EPE-138; EK3.06(4.2/4.5)

ANSWER 7.15 (1.50)

Normal wear reduces this design criteria of a new seal, making it hard to predict how long it will last.(+.5) So by removing the pump from service, minimize the chance of a #2 seal failure. (+1.0)

REFERENCE
SON AOI-23, pp3

003/000; PWG-7(3.5/3.9)

ANSWER 8.01 (1.00)

b.

REFERENCE
SQNP, IP-1

ANSWER 8.02 (1.00)

c.

REFERENCE
North Anna TS 3/4 1-1,-9,-12,-22
Farley TS 3//4
Sequoyah TS 3/4

ANSWER 8.03 (1.00)

a. false
b. ~~false~~ true

REFERENCE
SQNP Requal Trng. Inst. Notes

ANSWER 8.04 (1.50)

a. false
b. false
c. true

REFERENCE
SQNP AI-4, 12.1

ANSWER 8.05 (.50)

SE, Shift Engineer

REFERENCE
SQNP AI-2, 1.1

ANSWER 8.06 (1.50)

1. Seismic Instrumentation
2. RCS Operational Leakage or SG tube leakage
3. RCS Specific Activity
4. Containment Systems or Containment Vent Systems
5. Plant Systems Specific Activity or Secondary Plant Activity
6. Flood Protection
7. Snubbers any 5 [0.3] each

REFERENCE
SQNP TS Bases
SQNP Requal Trng. Inst. Notes

ANSWER 8.07 (2.00)

1. U-1 and U-2 shield bldg. gas monitors count rate.
2. U-1 and U-2 shield bldg. stack flow rate.
3. Aux bldg. gas monitor count rate.
4. Aux bldg. stack flow rate.
5. Service bldg. gas monitor count rate.
6. Service bldg. stack flow rate.
7. U-1 and U-2 condenser vacuum exhaust monitors count rate.
8. condenser vacuum exhaust assumed to be 45 cfm each. [0.25] each

REFERENCE
SQNP TI-30
SQNP Requal Trng. Inst Notes

ANSWER 8.08 (1.00)

Person holding the operating permit.

REFERENCE
SQNP AI-3; 3.1.7.1.

ANSWER 8.09 (1.00)

a. SQN IP-1, Emergency Plan Classification Logic
b. General Emergency

REFERENCE
SQN IP-1
SQNP Requal Trng. Inst. Notes; REP

ANSWER 8.10 (1.50)

one path from boric acid tanks via a boric acid transfer pump and a charging pump to the RCS. [0.5]

two paths from the RWST via charging pumps to the RCS. [1.0]

REFERENCE
SQNP TS 3.1.2.2

ANSWER 8.11 (1.00)

a. the unit shall be placed in at least Hot Standby within one hour.
b. the NRC Operations Center shall be notified (by telephone as soon as possible and in all cases) within one hour. [0.5] each

REFERENCE
SQNP TS 6.7

ANSWER 8.12 (1.00)

LCO 3.0.3 applies

REFERENCE
North Anna LCO 3.0.3.
FNP 3.0.3
SQNP 3.0.3

ANSWER 8.13 (1.00)

temp. does not exceed that temp. allowable (for the continuous duty rating specified) for equipment and instrumentation.

REFERENCE
SQNP TS B3/4.6.1.5
SQNP Requal Trng. Inst. Notes

ANSWER 8.14 (2.00)

The TA shall be entered on a PORC reviewed ~~[0.5]~~ [0.75], Plant Manager ~~[0.5]~~ (0.75) approved TACF [0.5] ~~and tagged in accordance with AI-9 [0.5].~~ 0

REFERENCE
SQNP AI-9

ANSWER 8.15 (1.00)

AFD (for each operable channel) must be monitored and logged [0.5] at least once per hour [0.5] (for the first 24 hours and at least once per 30 minutes thereafter).

REFERENCE
SQNP TS 3/4.2.1

QUESTIONS - RO Requal 1.01 (1.50)
RO License 1.03 (1.50)
SRO Requal 5.01 (1.50)
SRO License 5.02 (1.50)

Indicate whether the following will cause the power range instrument to be indicating HIGHER, LOWER or the SAME as actual power, if the instrument has been adjusted to 100% based on a calculated calorimetric.

a. If the feedwater temperature used in the calorimetric was higher than actual feedwater temperature.

b. If the reactor coolant pump heat input used in the calorimetric is omitted.

c. If the steam flow used in the calorimetric was lower than actual.

ANSWER

a. Higher
b. Lower
c. Higher

REFERENCE
NUS Vol 4, pp 2.2-4

015/000; A1.01 (3.5/3.8)

Answer to part a. should be lower. Using a higher feedwater temperature would cause the Δh across the S/G to be lower resulting in a lower calculated (indicated) power than actual power

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

Answer to part b. should be higher. Calorimetric calculation uses the following equation reactor power

Reactor Power = NSSS power - Reactor Coolant Pump Energy Input

Neglecting RCP input would make indicated (calculated) power greater than actual power (Reference TI-2; attached)

Answer to part c. should be lower. The S/G heat balance uses the following equation to calculate NSSS power

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

Using a lower $\dot{m}$ would cause calculated power (indicated power) to be lower than actual power.

QUESTIONS - RO Requal 1.03 (1.00)
RO License 1.04 (1.00)
SRO Requal 5.03 (1.00)
SRO License 5.03 (1.00)

Attached Figure #219 shows a power history and four possible xenon traces (reactivity vs time). Select (a, b, c, or d) the curve that correctly displays the expected xenon transient for the given power history.

ANSWER

c

REFERENCE
EIH: GPNT, Vol VII, Chapter 10.1-83-86
BSEP: L/P 02-2/3-A, pp 172 - 176; 02-0G-A, pp 57 - 60
Westinghouse Nuclear Reactor Theory, pp. I-5.77 - 79
Turkey Point, Reactor Core Control, pp. 4-24 - 28

001/000-K5.13 (3.7/4.0)

b is the correct answer

Reference attached plot from * XENON (PRIME computer program of Xenon at reactivity worth as a function of time)

QUESTIONS - RO Requal 1.07 (1.00)
RO License 1.10 (1.00)
SRO License 5.10 (1.00)

a. Which power defect is the major contributor to the Total Power Defect at EOL?

b. What is the major cause of the existence of a void defect?

ANSWER

a. Doppler defect (+.5)
b. Nucleate boiling

REFERENCE
Westinghouse Reactor Core Control, pp 3-38/42

001/000; K5.49(3.4/3.7)

Part a. Answer should be either Moderator and Doppler make roughly the same contribution at EOL or Moderator is major contributor. Cycle 4 data indicates that Moderator and Doppler make roughly the same contribution at EOL (Reference attached Requal lesson plan and design report curves). However, in previous cycles, moderator has always dominated at EOL.

QUESTIONS - RO Requal 1.09 (1.00)
RO License 1.14 (1.00)

List the four most significant causes of Non-condensible gas formation in the RCS during the first hour following a LOCA. Assume the PZR empties after several minutes and forced convection flow is not available. Also, pressure does not drop to a level requiring any SI tank to inject and fuel rods have not ruptured.

ANSWER

1) Dissolution of H2 (due to mass loss of pressure drop) (+.25 ea)
2) Radiolysis
3) PZR vapor space expansion
4) Zirc-water reaction

REFERENCE
SQN EGT 222.006, pp 23

EPE-009; EK3.11 (4.4/4.5)

"Gases from the pressurizer vapor space" should be accepted in lieu of "Pressurizer Vapor Space Expansion"

(Reference Requal Lesson Plan attached)

QUESTIONS - RO Requal 1.10 (1.50)
RO License 1.11 (1.50)
SRO Requal 5.08 (1.50)
SRO License 5.11 (1.50)

List the three main sources of fission neutrons in the core at each end of life and indicate their approximate contribution (in %) to power.

ANSWER

Pu-239 37% (+/-3) (+.3 for isotope, +.1 for %, + .1 for correct order)
U-235 35.5% --thermal fission
U-235 8% --fast fission

REFERENCE
SQN/WBN License Cert Trng, "Reactor Kinetics", pp 6
St Lucie Reactor Physics Section 7.6.7; SD 1, pp 33

Question did not solicit an order nor did it solicit seperating thermal and fast fission contributions. Candidates learned cycle 4 numbers. Therefore the following numbers should be accepted: (Reference attached Figure from Requal Lesson Plan)

U-235 43%
Pu-239 40%
U-238 8%.

QUESTION - RO Requal 2.03 (1.00)

Which of the following describes the basic flowpath through the Hydrogen Recombiners?

a. Mixing chamber, preheater, recombination region
b. Mixing chamber, recombination region, heater section
c. Preheater, recombination region, mixing chamber
d. Preheater, mixing chamber, recombination region
e. Preheater, mixing chamber, heater section

ANSWER

c

REFERENCE
Surry ND-88.4-LP-8, pp 8.6
Westinghouse Systems Manual, pp 4.5-20

028/000; K6.01(2.6/3.1)

This is not even remotely related to safe operation of the plant. Delete the question.

(Reference NUREG 1021)

RO 2.12

QUESTION - RO Requal 2.04 (2.00)

a) For the following loads, indicate what combination of ERCW headers (1A, 1B, 2A and/or 2B) is the NORMAL source of cooling water:

1) CCS Heat Exchanger "C"
2) EDG Heat Exchanger 2A-A
3) Containment Spray Heat Exchanger 1B

b) What 5 criteria/interlocks must be met for ERCW pump KA to auto start?

ANSWER

a) (1) 2B (+.33 ea)
(2) 1A
(3) 1B

b) (1) SI from Train 1A or 2A (+.2 ea.)
(2) No blackout signal
(3) Transfer switch on swgr in Normal
(4) KA selected for operation
(5) Pump RA not running

REFERENCE
SQN Requal 1986 week 1, day 4, "ERCW", pp 4-9

076/000; K1.01(3.4/3.3), K1.05(3.8/4.0), K1.19(3.6/3.7), K4.02(2.9/3.2)

Should also accept the following:

1) Control Board Handswitch in Auto

2) No Lockout

3) Control Power Available

(Reference SQN Drawing 45N765-15)

QUESTIONS - RO Requal 2.06 (1.00)
RO License 2.14 (1.00)
SRO License 6.11 (1.00)

Provide the system pressures at which the following ECCS components will start to inject following a LOCA: (use criteria stated in EOPs)

a. SI Pumps
b. RHR pumps
c. Upper Head Injection

ANSWER

a. 1500 psig (+/- 25 psig) (+.33 ea)
b. 180 psig
c. 1250 psig

REFERENCE
SQN E-0, pp 3, Westinghouse Systems Manual, pp 4-1-33

EPE-011; EK3.12(4.4/4.6)

Should accept 1185 psig to 1285 psig for part c.

(Reference SQN Tech Spec LCO 3.5.1.2)

QUESTIONS - RO Requal 2.09 (1.00)
RO License 2.17 (1.00)
SRO License 6.13 (1.00)

What 4 different ECCS related components are tagged out at low pressures to help prevent inadvertant over pressurization at low temperatures?

ANSWER

-SI Pumps (+.25 ea)
-ONE Centrifugal Charging Pump
-UHI Gags
-Cold leg Accumulator Isolation Valves

REFERENCE
SQNP System Descrip. "RCS", pp 9

001/000; K1.02 (3.9/4.1)

SQN GOI 3B only requires the SI pumps and Cold Leg Accumulator Isolation Valves to be tagged out. UHI gag motors are only required to have power removed and the one Centrifugal Charging Pump is only required to be pulled to lock. The UHI gag motors and the one Centrifugal Charging Pump can be tagged at the discretion of the Unit ASE, but are not required to be tagged. Therefore, the only 2 required responses to this question are SI pumps and Cold Leg Accumulator Isolation Valves.

QUESTIONS - RO Requal 2.11 (1.50)
RO License 2.19 (1.50)
SRO Requal 6.11 (1.50)
SRO License 6.17 (1.50)

a. Describe the order of processing elements in the Air Cleanup Units through which air is drawn by the Air Cleanup Subsystem.

b. How are the processing elements in an INACTIVE air cleanup unit loaded with radioactive material kept cool?

ANSWER

a. deminster>>>relative humidity heater>>>prefilter bank>>>HEPA filter bank>>>Carbon adsorber bank>>>electric heating element>>>carbon adsorber bank>>>HEPA filter bank (+.125 ea)
b. Two cross over air flow ducts draw air from the active air cleanup unit (+.5)

REFERENCE
SQNP Sys Descrip. 4.4, "Containment Air Purif and Cleanup System" pp 7-8

027/000; A2.01 (3.0/3.3)

Part a should not require that the processing elements be listed in order. It is quite sufficient that the candidate know what the elements are, not necessarily what order they are in. Also, the electric heating element between the charcoal banks does not exist.

(Reference SQN Drawing 47W866-1)

RO Requal 3.02

QUESTION - SRO License 6.06 (1.00)

Which one of the graphs A-D in figure 603 correctly depicts the Pressurizer Pressure control system, Master controller output signal, based upon the demand signal shown?

ANSWER

d.

REFERENCE
SQN Requal 1986 Week 5/6, day 7, "Control System Theory"
202002 K4.08 3.3/3.4
5.03 2.4/2.4

None of the four answers is correct. The output of the pressurizer pressure controller is parabolic due to the fact that it is a proportional-integral (PI) controller. Delete question.

(Reference attached output graph, TI-41 scaling data sheet, and SQN Calibration Card).

QUESTIONS - RO Requal 3.03 (1.25)
RO License 3.05 (1.25)

Describe what happens to the coils associated with the CRDMs and what 2 alarms/indications actuate on an Urgent Failure of the rod control system.

ANSWER

The stationary and movable grippers energize and the lift coil deenergizes (+.75); ROD URGENT FAILURE Alarm and red lamp at power cabinet actuate (+.5)

REFERENCE
SQN "Rod Control System", pp 12

001/050; A2.01(3.7/3.9)

"Urgent Failure lamp on Logic Cabinet" should also be accepted.

(Reference Westinghouse Rod Control Training Manual attached)

QUESTIONS - RO Requal 3.05 (.50)
RO License 3.07 (.50)

TRUE or FALSE: If the upper detector on a power range NI fails low while at 75% power, the operation of the upper detector current comparator is defeated.

ANSWER

true (+.5)

REFERENCE
SQN "Excore NIs", pp 18

015/000; 6.04(3.2/3.4)

Answer is False. All four detectors below 50% power are required for auto defeat. A failed detector can be manually defeated on the NIS panel, but the question implies an auto defeat.

Reference NRC Systems Manual
Westinghouse NIS Training Manual

QUESTIONS - RO Requal 3.07 (1.50)
RO License 3.11 (1.50)
SRO Requal 6.06 (1.50)
SRO License 6.12 (1.50)

What 4 signals will automatically initiate the operation of the Auxiliary Building Gas Treatment System?

ANSWER

-Phase A Containment Isolation signal from either Unit (+.375 ea)
-High Radiation signal from fuel handling bldg area rad monitors
-High Radiation signal from aux Bldg exhaust vent rad monitors
-High Temperature in Aux Bldg Supply Fan Suction

REFERENCE
SQNP Sys Descr. 4.4, "Cont Air Purif and Cleanup Sys" pp 15

EPE-060; PWG-10 (4.1/4.4)

High Radiation from RM-90-102 and RM-90-103 (Spent Fuel Pit Rad Monitors) are separate signals. RM-90-102 will only cause 'A' train ABGTS initiation and RM-90-103 will only cause 'B' train ABGTS initiation. Therefore, credit should be given for these two signals as seperate signals. (Reference Plant Drawing 45N630-4 attached)

RO 3.75
to equal 3.10

QUESTIONS - SRO Requal 6.07 (1.50)
SRO License 6.15 (1.50)

An SI signal was generated due to a transient caused by an undervoltage condition on the 2A-A 6.9KV Bus. During this transient, the 2A CHG Pump breaker stayed closed causing an EDG lockout. (all other loads were removed) What 5 actions must the operator take to load equipment on that bus using the 2A-A EDG?

ANSWER

1) Open CCW pump breaker (+.3 ea.)
2) Reset SI
3) Reset EDG lockout
4) Start EDG
5) Manually load equipment

REFERENCE
SQN ELEDST

EPE 055; EA2.06(3.7/4.1), PWG-11(4.3/4.4)

Question implies that a D/G lockout occurred as a result of the transient. An undervoltage condition on the shutdown board or an SI signal will cause an emergency start of the D/G which will allow only Generator Differential or Engine Overspeed to trip the D/G. Also, the overcurrent relay on the Diesel Breaker will not trip the breaker unless either the normal or alternate feeder breakers are closed. If the Diesel is tied to the board by itself, there is no overcurrent protection on the Diesel breaker. Delete the question due to confusion caused by implication that D/G will lockout if 2A-A Charging pump breaker does not load shed.

Reference attached drawings 45N767-2
45N767-4
45N767-5
45N765-2

QUESTIONS - RO Requal 4.05 (1.00)
RO License 4.05 (1.00)
SRO Requal 7.04 (1.00)
SRO License 7.06 (1.00)

The loss of which one of the following 125 VDC Vital Battery Boards will cause a reactor trip and also number 2/4 S/G MSIVs and main feed regulation bypass valves to close?

a. Unit 2, Board I
b. Unit 1, Board II
c. Unit 2, Board III
d. Unit 1, Board IV

ANSWER

c

REFERENCE
SQN AOI-21.7, pp 1

EPE-058; PWG-10(4.1/4.2)

b and c are both correct answers. Loss of 125V Vital Battery Board II will cause a reactor trip on Unit 1 and 2/4 S/G MSIVs and main feed regulating bypass valves to close.

Reference SQN AOI 21.2

QUESTION - RO Requal 4.10 (.75)

Aside from the on-shift SE (Shift Engineer), what other 3 personnel may authorize clearances at Sequoyah Nuclear Plant?

ANSWER

1) ASE (+.25 ea)
2) Outage Coordinator
3) Other SEs assigned to the shift

REFERENCE
SQN AI-3, pp 2

PWG-14(3.6/4.0)

Chickamauga Load Dispatcher (CLD) should also be accepted

QUESTIONS - RO Requal 4.15 (1.00)
RO License 4.20 (1.00)
SRO Requal 7.12 (1.00)
SRO License 7.19 (1.00)

EOP E-3, "SGTR", requires the operator to maintain AFW flow to the rupture S/G until narrow range level is established. Provide two reasons for this procedural requirement.

ANSWER

1) (Promote thermal stratification) so ruptured S/G doesn't depressurize during cooldown (+.5 ea)
2) Ensures S/G available as a heat sink if required

REFERENCE
Westinghouse ERG Background Document; (TPT QBNK 18)

EPE-038; EK3.06(4.2/4.5)

Iodine Scrubbing by the liquid portion of the S/G mass should be accepted as one of the two reqired responses. AFW flow should be maintained until the tubes are covered to assure that the break is not open to the steam space so that iodine can be retained in solution to prevent exceeding offsite dose limits

Reference Westinghouse Steam Generator Tube Rupture Training Manual attached.

QUESTIONS - SRO Requal 5.05 (1.50)
SRO License 5.07 (1.50)

AN ECC is calculated for a startup following a reactor trip from 50% power equilibrium xenon (BOL). Indicate if the actual critical rod position will be HIGHER, LOWER or the SAME from the calculated position for each of the following situations. Use attached curves as appropriate and treat each case individually.

a. Xenon reactivity curve for trip from 100% is used to calculate conditions to startup 20 hours after the trip.

b. Boron worth at EOL is used vice BOL worth. (Dilution is required to reach desired Boron concentration in both cases)

c. The EOL critical Boron Concentration is used instead of the BOL critical Boron concentration.

ANSWER

a. Lower (+ .5 ea)
b. Lower
c. Higher

REFERENCE
ST Lucie OP 0030126 and Plant Curves
CNTO Reactor Core Control, Section 7

Part c cannot be answered. Critical Boron Concentration can vary greatly at BOL and EOL. There is no one BOL Critical Boron Concentration or EOL Critical Boron Concentration. Not enough information supplied to answer the question. Delete the question.

QUESTIONS - RO License 1.20 (1.00)
SRO Requal 5.11 (1.00)

The attached figure shows the change in pressure across a pressurizer PORV and its associated upstream and downstream piping for various valve positions. EXPLAIN why the major pressure drop occurs in piping segment P1-P2 when the valve is slightly open, whereas the major pressure drop occurs in piping segment P2-P4 by the time the valve is fully open.

ANSWER

When slightly open, the pressure drop is across the valve itself as there is isenthalpic expansion (+.5). As the valve is fully opened, head losses in the piping become more significant (+.5)

REFERENCE
Westinghouse Thermal/Hydraulic Principles, pp 10-71/73

010/000; K5.02(2.6/3.0)

Some credit should be given for a discussion of increased frictional losses through a throttled valve causing a larger pressure drop just downstream of the valve. Also, it is doubtful that any candidate will use the term "isenthalpic expansion" in their discussion. Answers that include discussions of unrecovered head loss due to high velocity steam passing through the throttled valve should also be considered.

QUESTIONS - SRO Requal 6.04 (1.50)
SRO License 6.10 (1.50)

Fill in the blanks in the statement below concerning the Containment Air Return System:

Both fans are actuated upon an _____ actuation signal but are delayed starting for _____ minutes. They continuously draw air from the dome of the containment vessel and from the following pocketed spaces _____, _____, _____, and _____.

ANSWER

Containment Hi-Hi pressure; 10; S/G enclosures; PZR enclosure; accumulator spaces; instrument room (+.25 ea)

REFERENCE
Westinghouse PWR Systems Manual, sect 4.5, pp 14

022/000; PWG-4 (3.5/3.8)

Either Containment Hi-Hi Pressure or Phase B are acceptable answers. Containment Hi-Hi Pressure generates a Containment Isolation Phase B signal which starts the Air Return Fan Timers.

(Reference SQN Drawing 45N779-5)

QUESTIONS - SRO Requal 7.08 (1.50)
SRO License 7.13 (1.50)

AOI-29, "Dropped or Damaged Fuel Assembly", discusses the "Worst Case" event of a dropped and damaged fuel assembly. What are the 3 criteria, that if met, could result in a radioactive release high enough to require implementation of the REP? (ie. the worst case)

ANSWER

1. < 100 hours after shutdown (+.5 ea)
2. Assembly from the highest core power region
3. All fuel rods damaged

REFERENCE
SQN AOI-29, pp 5, 8

EPE-036; EK3.03(3.7/4.1)

Tech Spec LCO 3.9.3 does not allow movement of irradiated fuel in the reactor vessel unless the reactor has been subcritical at least 100 hours. Therefore, the less than 100 hours after shutdown criteria should not be required as part of the answer.

QUESTION - SRO Requal 7.13 (1.50)
SRO License 7.20 (1.50)

The Response Not Obtained for step 1 of FR-H.1, "Response to Loss of Secondary Heat Sink" states: If ALL S/G Wide Range levels < 25%, then STOP ALL RCPs and immediately initiate feed and bleed per steps 11 to 13. Why are the RCPs tripped prior to initiating feed and bleed, aside from the fact that heat input from the pumps will be removed?

ANSWER

RCPs will keep 2 phase flow mixture (+.75) and the PORVs will not be able to release as much steam (energy) (+.75)

REFERENCES

Westinghouse background document

EPE-074; EK3.08(4.1/4.2)

There is nothing in the Westinghouse background document that supports this answer. All of the reasons for tripping the pumps in the background document are related to RCP heat input. Delete the question.

QUESTIONS - SRO Requal 8.03 (1.00)
SRO License 8.05 (1.00)

True or False

a. Rad Tumbler Sets are installed on doors leading directly to high radiation areas but not exceeding 1000 mr/hr.

b. The Plant Health Physicist controls the keys to the Rad Security Locks

ANSWER

a. false
b. false

REFERENCE
SQNP Requal Trng. Inst. Notes

Part b. is true. The Plant Health Physicist and the Shift Engineer control Keys to the Rad Security Locks.

ENCLOSURE 4

REQUALIFICATION PROGRAM EVALUATION REPORT

Facility: Sequoyah Nuclear Plant
Examiner: W. Dean, D. Nelson, L. Lawyer, C. Shiraki, J. Whittemore
Date(s) of Evaluation: December 15-18, 1986
Areas Evaluated: X Written ____ Oral ____ X Simulator

Examination Results:

	RO Pass/Fail	SRO Pass/Fail	Total Pass/Fail	Evaluation (S, M or U)
Written Examination	1/3	7/1	8/4	M
Operating Examination				
Oral	N/A	N/A	N/A	N/A
Simulator	4/0	8/0	12/0	S

Evaluation of facility written examination grading N/A

Overall Program Evaluation

Satisfactory ___ Marginal X Unsatisfactory ___ (List major deficiency areas with brief descriptive comments)

Operator performance on the simulator phase of the examination was good, with effective use of emergency procedures and crew interaction particularly noteworthy. More concerted use of annunciator response procedures should be emphasized in future requalification training on the simulator. A major deficiency was reactor operator (RO) performance on the written examination. One RO was evaluated as substandard in 3 of the 4 examined areas. Generic weaknesses were noted in section 4 of the written examination, particularly knowledge of the guidelines for usage of Emergency Operating Procedures (EOPs) and the bases for performing key steps in EOPs.

Submitted:	Forwarded:	Approved:
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