UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

EXAMINATION REPORT

Facility Licensee: Carolina Power and Light Company
411 Fayetteville Street
Raleigh, NC 27602

Facility Name: H. B. Robinson

Facility Docket No.: 50-261

Written and oral examinations were administered at H. B. Robinson near Hartsville, South Carolina.

Chief Examiner: Sandy Lawyer — 8/31/84
Sandy Lawyer — Date Signed

Approved By: Bruce A. Wilson — 8/31/84
Bruce A. Wilson — Date Signed

Summary

Examinations on July 17 - 20, 1984

Written and Oral examinations were administered to four candidates, three of whom passed.

REPORT DETAILS

1. Persons Examined

RO Candidates

Jones, Michael J.	55-20419
Norris, Bruce T.	55-20420
Shane, Robert H.	55-20421
Stover, William E.	55-20418

Other Facility Employees Contacted:

*Richard S. Allen, Senior Specialist-Training
*James Pierce, Specialist-Training
*C. Wayne Crawford, Manager, O&M
*William M. Blaisdell, Senior-Specialist-Training
*David A. Neal, Specialist Training
*Guy Beatty, Manager, RNPD
*John Benjamin, Princ. Engineer-OPS
C. A. Bethea, Director-Training
Arlene Stokes, Training Clerk

*Attended Exit Meeting

2. Examiners:

*Sandy Lawyer
B. A. Picker

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examination, the examiners met with R. S. Allen, W. M. Blaisdell, and D. A. Neal to review the written examination and answer key. The following comments were made by the facility reviewers:

a. RO Exam

1. Question 1.03.c

Facility Comment: Heatup is not more limiting than cooldown. The different rate (i.e., 60°F/Hr.) on heatup is due to pump heat input capacity.

Resolution: Question and answer deleted. Technical specifications are vague and are not specific as to which is the most limiting.

2. Question 1.08

Facility Comment: Either answer 2 or 3 could be correct depending on assumptions made for Beta value. (.006 to .0075).

Resolution: Answer 2 or 3 will be accepted.

3. Question 1.13

Facility Comment: ROs do not need to know moderator ratio values to operate the plant. Therefore answers b and c are equally correct.

Resolution: Answers b or c will be accepted.

4. Question 2.02

Facility Comment: Answer should say "Containment Air Exhaust" instead of "Containment Exhaust" because the candidate may use slightly different wording.

Resolution: Inserted the word "air" into the answer sheet and will look closely for different wording uses by candidates.

5. Question 2.03

Facility Comment: There is no correct answer to question on CVC-283's drain path. This valve drains to room floor drain.

Resolution: Deleted answer for drain path for this valve. Dropped 0.3 pts from section total.

6. Question 2.04

Facility Comment: Answer b is wrong. Correct answer is c. per logic diagram.

Resolution: Answer b or c will be accepted because of a conflict between system description and logic diagrams. Will not penalize the candidate for training material errors.

7. Question 2.07

Facility Comment: Change answer to #4.

Resolution: Answer key changed.

8. Question 2.08

Facility Commment: Question as written does not solicit the answers as indicated. Answer b.1. seems logical but not b.2.

Resolution: Accepted comment. Will accept b.1. and any other correct answer.

9. Question 3.04

Facility Comment: The answer for the RPI dropped rod should be "load limiter" not "load reference."

Resolution: Answer key changed.

10. Question 3.08

Facility Comment: To complete the answer for this question steam dump operation should be included.

Resolution: The steam dump answer will be included and the point breakdown adjusted to 0.4 per part.

11. Question 4.07.a

Facility Comment: The reason not to cooldown below hot standby is to conserve water.

Resolution: Answer changed to include conservation of water as the reason.

12. Question 4.08.a

Facility Comment: Answer a.3., RCV-18 is not manually closed. WD-1785 is the valve that is closed manually.

Resolution: A.3 changed to read WD-1785.

13. Question 4.09.b

Facility Comment: Answer is incorrect for question stated. Overpressure condition would not give alarm because relief valve dumps downstream of the detector. A better answer is electronic failure.

Resolution: Answer changed to electronic failure.

4. Exit Meeting

At the conclusion of the site visit, the chief examiner met with representatives of the plant staff to discuss the results of the examination. Those individuals who clearly passed the oral examination were identified.

There was no generic weakness noted during the oral examination. The cooperation given to the examiners and effort to ensure an atmosphere in the control room conducive to oral examinations was noted and appreciated.

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

Reviewed by
1. S. ALLEN
2. W. BLAISDELL
3. D. NEAL
4. _____

FACILITY: ROBINSON
REACTOR TYPE: PWR-WEC3
DATE ADMINISTERED: 84/07/17
EXAMINER: PICKER, B.
APPLICANT: ~~MASTER COPY~~

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. 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 six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
~~25.00~~ 24.50	~~25.00~~			1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
~~25.00~~ 24.70	25.00			2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
25.00	25.00			3. INSTRUMENTS AND CONTROLS
25.00	25.00			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
100.00	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 1.01 (1.00)

Which of the statements below would indicate that Natural Circulation has been established in the RCS as described in GP-012 "Plant Temp. and Pressure Control using Natural Circula."

a. Delta temperature across the core is increasing and greater than full load delta temperature.

b. Core outlet temperature is decreasing and less than saturation temperature.

c. Steam generator level is increasing with constant auxiliary feedwater flow.

→ d. Steam generator pressure is decreasing and is near sturation pressure for the RCS temperature. (1.0)

QUESTION 1.02 (1.50)

TRUE or FALSE?

a. The 100% reactor power Departure from Nucleate Boiling Ratio (DNBR) is GREATER THAN 20% reactor power DNBR. (0.5)

b. DNB occurs at or before the point at which the convective heat transfer coefficient is at its MAXIMUM value. (0.5)

c. For a constant temperature difference (Twall - Tsat), if RCS → pressure decreases, the heat transfer rate (BTU/hr sqft) prior to Departure from Nucleate Boiling decreases. (0.5)

QUESTION 1.03 (2.00)

a. What effect (INCREASE, DECREASE, or NONE) does fast neutron irradiation of the reactor vessel (RV) wall have on the RV Reference Nil-Ductility Temperature (RT-NDT)? (0.5)

b. Indicate whether a ductile failure OR a brittle failure would be the most TYPICAL during RV overpressurization at temperatures less than RT-NDT. (0.5)

c. Briefly explain why the reactor coolant system heatup rate is more restrictive than the cooldown rate. (0.5)

d. Two bases for Pressurizer Thermal Limits are RT-NDT and Metal Fatigue. Which of these would cause the Pressurizer Thermal Limits to be more restrictive? (0.5)

QUESTION 1.04 (2.00)

TRUE or FALSE

a. The faster a centrifugal pump rotates, the greater the NPSH required to prevent cavation.

b. The purpose of the increasing area of the centrifugal pump volute is to convert the pressure head of the fluid to velocity head.

c. Pump runout is the term used to describe the condition of a centrifugal pump running with no volume flow rate.

d. The pressurizer level channels which are hot calibrated will indicate higher than the actual pressurizer level at lower operating temperatures. (2.0)

QUESTION 1.05 (2.50)

Indicate HOW (INCREASE, DECREASE, or NO CHANGE) the following will affect UNIT efficiency at steady state full power. Consider the effected parameter ONLY.

a. Absolute condenser pressure changes from 1.25 psia to 1 psia.

b. Total S/G blowdown is changed from 35 gpm to 40 gpm.

c. Condenser hotwell temperature changes from 125 F to 130 F.

d. Steam quality changes from 99.8% to 99.7%.

e. Low pressure heater bypass valve (HCV-1459) fails open. (2.5)

QUESTION 1.06 (2.00)

Assume one RCP trips at 40% power, without a reactor protection system actuation or a change in turbine load. Indicate whether the following parameters will INCREASE, DECREASE, or REMAIN THE SAME.

a. Flow in the operating reactor coolant loops. (0.4)

b. The ratio of core flow compared to the total loop flow. (Core Flow/Total Loop Flow) (0.4)

c. Reactor Vessel delta pressure. (0.4)

d. Core delta temperature. (0.4)

e. Operating loop steam generator temperatures. (0.4)

QUESTION 1.07 (1.00)

For the following statements choose the most correct answer:

a. The reactivity worth of samarium at 25% equilibrium power is (GREATER THAN, LESS THAN, or EQUAL TO) the reactivity worth at 100% equilibrium power. (0.5)

b. The total power coefficient (pcm/%power) at BOL is (MORE NEGATIVE THAN, LESS NEGATIVE THAN, or EQUAL TO) the power coefficient at EOL. (0.5)

QUESTION 1.08 (1.50)

MULTIPLE CHOICE

The reactor has just reached criticality when a very rapid 15 ppm dilution of the RCS occurs.

a. The resultant stable SUR (for BOL conditions) from this dilution is:

1. 0.25 to 0.49 DPM
2. 0.5 to 0.74 DPM
3. 0.75 to 0.99 DPM
4. 1.0 to 1.24 DPM

(1.0)

and boron high enough to get 15 PPM dilution

→ b. Assume that the same events occurred at EOL. Would the SUR be HIGHER, LOWER or THE SAME? (0.5)

QUESTION 1.09 (2.50)

After a reactor startup from refueling, the power level is maintained at 50%.

a. Approximately how much time will it take for the reactor to establish an equilibrium level of Xenon? (0.5)

b. If power level is increased to 100% after three months of 50% power operation, will the Samarium concentration immediately INCREASE, DECREASE, or REMAIN UNCHANGED? (0.5)

c. COMPARE the EQUILIBRIUM concentrations of Xenon for the initial 50% power condition and after the 100% power condition. Will the Xenon (Contration) concentration at 100% be twice that at 50%? (0.5)

→

d. After a shutdown from 100% power operation, when will Xenon and Samarium reach their respective peak values? (1.0)

QUESTION 1.10 (.50)

MULTIPLE CHOICE

Which are the reactivity coefficients that combine to give the Power Coefficient?

a. Moderator, pressure, isothermal, doppler

b. Doppler, pressure, isothermal, void

c. Doppler, moderator, isothermal, void

d. Moderator, temperature, void, pressure, doppler (0.5)

QUESTION 1.11 (1.00)

For a reactor operating at a constant power and temperature, the thermal neutron flux near EOL will be (GREATER THAN, SMALLER THAN, or THE SAME AS) the flux near BOL? EXPLAIN. (1.0)

QUESTION 1.12 (2.50)

For two separate startups, assuming the only difference between the two startups is that startup #1 ROD SPEED is TWICE as fast as startup #2. Qualitatively COMPARE and BRIEFLY EXPLAIN the differences between the two startups in regard to the following:

a. Critical Rod Height.

b. Power Level at criticality.

c. Startup rate at criticality. (2.5)

QUESTION 1.13 (1.00)

Choose the BEST answer to complete the following statement.

Your core is designed to:

a. be overmoderated to enhance neutron absorbtion.

b. have a moderator to fuel ratio of about 4.0 to 4.5.

c. be undermoderated to enhance neutron leakage.

d. be borated to enhance neutron leakage rather than thermal utilization. (1.0)

QUESTION 1.14 (1.00)

a. Explain why fission product gas build-up in the fuel to clad gap (ignore the pressure buildup in the gap) causes the doppler coefficient to become more negative over core life. (0.5)

b. Does the effect of "clad creep" cause the doppler coefficient to become MORE or LESS negative, over core life. (0.5)

QUESTION 1.15 (3.00)

a. The reactivities that are used to calculate a Shutdown Margin can be grouped into 5 types. NAME each of the 5 different types. (1.5)

b. What are the Shutdown Margin values required for the following conditions?

1. Cold Shutdown (Tech. Specs) (0.5)
2. Refueling (Tech. Specs) (0.5)
3. CP&L Admin. limit for Hot or Cold Shutdown. (0.5)

QUESTION 2.01 (1.50)

What operator actions are required on the Safety Injection System at the following conditions?

a. < 2000 psig (pressurizer) (0.5)

b. < 526 F (RCS temperature) (0.5)

c. < 1000 psig (pressurizer) (0.5)

QUESTION 2.02 (2.50)

The Post Accident Containment Venting System uses two supply lines for hydrogen free air and two exhaust lines for venting. NAME the systems used to provide the supply flow paths and the systems used for the venting flow paths. INDICATE which is the primary supply and which is the primary exhaust. (2.5)

QUESTION 2.03 (2.40)

The relief valves listed below protect the charging system and letdown portions of the chemical and volume control system. Match the relief valve with its respective tank and setpoint.

VALVE	LOCATION	SETPOINT	RELIEVES TO
CVC-203	letdown line downstream of letdown orifices.	a. 200 psig	1. Reactor Coolant Drain Tank
CVC-209	letdown line downstream of low pressure letdown valve.	b. 75 psig	2. Waste Gas Decay Tank
CVC-257	Volume Contol Tank	c. 2735 psig	3. Pressurizer Relief Tank
CVC-283	Reciprocating charging pump discharge.	d. 300 psig	4. Volume Control Tank
		e. 600 psig	5. Holdup Tank (2.4)

QUESTION 2.04 (1.00)

Select the statement below that best describes the operation of the Containment Air Recirculation System Fans during a maximum credible accident (LOCA, Steam Leak etc.). The fans will:
Blackout with

a. remain operating until manually shutdown.

b. automatically shutdown until the diesels are started then they must be manually started.

c. automatically shutdown until the diesels are started then they automatically start.

d. automatically shutdown and are made inoperable by the safety system.

e. automatically shutdown until containment pressure reaches 5 psig then they will automatically start. (1.0)

QUESTION 2.05 (3.00)

a. Describe HOW the Power Range PROTECTIVE/PERMISSIVE outputs are different from the CONTROL outputs (from level amp output to the relay drivers or control system inputs) and WHY the output circuits are different? (1.0)

b. Indicate whether each of the following statements are TRUE or FALSE concerning the construction and operation of the POWER RANGE NUCLEAR INSTRUMENTATION detector. No explanation is required.

1. Uses Argon gas iside the detector to limit dead time.

→ 2. Uses Boron-trifloride (BF3) gas in the outer volume of the detector

3. Uses Boron-trifloride (BF3) gas in both inner and outer volumes of the detector.

4. Operates in the Ionization region of the gas amplification curve. (Detector voltage vs. Current curve).

→ 5. Uses compensation circuitry to cancel gamma current. (2.0)

QUESTION 2.06 (3.75)

a. Briefly explain the operation of the Component Cooling Water Surge Tank to high pressure, contaminated in leakage. INCLUDE in your explanation any monitors that affect the surge tank parameters and components, alarms, surge tank parameter changes and the effluent pathway. (1.5)

b. For the following situations, indicate the operation of EACH Component Cooling Pump (A,B and C). ASSUME that pumps A and B are operating with C in standby (not running).

1. Undervoltage on bus E-1. (0.75)

2. Low CCW pressure with bus E-2 supplied by the diesel generator. (0.75)

3. Plant BLACKOUT, DBA LOCA in progress and both diesels have been started. (0.75)

QUESTION 2.07 (2.50)

a. MULTIPLE CHOICE
Which Reactor Coolant System (RCS) loop(s) supply the pressurizer spray valves?

1. loop 1

2. loops 1 and 2

3. loops 1 and 3

4. loops 2 and 3

5. loops 1, 2 and 3 (1.0)

b. Which RCS loop does the pressurizer surge line connect to? (0.5)

c. List TWO of three reasons why a small continous flow is maintained through the pressurizer spray lines. (1.0)

QUESTION 2.08 (1.85)

a. Which ion-exchanger (MIXED BED or CATION) would NORMALLY be used to remove an excess of Lithium-7 from the reactor coolant system? (0.5)

b. What two (2) different kinds of signals will cause the automatic closure of the CVCS letdown orifice isolation valve? (1.0)

c. Why must charging flow be started before letdown if RCS Temperature is > 200 F? (0.35)

QUESTION 2.09 (3.50)

a. WHAT is the purpose of the No. 1 seal bypass valve on the Reactor Coolant Pump and WHAT are the RCS minimum and maximum pressure requirements imposed for opening the valve? (values required) (1.0)

b. The RCP No. 1 seal water return flow to the CVCS is isolated upon a phase "B" containment isolation. WHAT provision is made for maintaining seal leakoff after the isolation valves close? (1.0)

c. If the leakage through No. 3 seal is greater than normal, will the No. 2 seal standpipe level INCREASE or DECREASE? (0.5)

d. Explain the reason for maintaining a minimum of 15 psig in the VCT in reference to the RCPs. (1.0)

QUESTION 2.10 (3.00)

a. What is the explanation for the precaution in the procedure for the Auxiliary Feedwater System OP-402 that says, to stop the pump and then close the discharge valves when securing a motor-driven pump? WHY is the precaution necessary? (1.0)

b. What signals will cause the AUTOMATIC start of the motor-driven Auxiliary Feedwater Pumps? INCLUDE ANY LOGIC/COINCIDENCE. (0.8)

What signals will cause the AUTOMATIC start of the turbine driven Auxiliary Feedwater Pumps? INCLUDE ANY LOGIC/COINCIDENCE. (0.4)

c. What are the 3 water supplies to the Auxiliary Feedwater System. List in order of preference. (0.8)

QUESTION 3.01 (2.80)

a. Listed below in column A are 3 conditions which cause various valves in the Feed system to close and/or pumps to trip as in column B. For each column A condition select the action from column B that will occur (automatic only).

COLUMN A	COLUMN B
1. Safety Injection	aa. Shuts Main Feed Regulating Valves (MFRV)
2. Reactor Trip	bb. Shut respective MFRV and trips both feed pumps.
3. High-High S/G level	cc. Complete Feedwater isolation

(1.2)

b. What 2 signals will cause steam line isolation to occur? (0.8)

c. Describe the 2 different methods of shutting Main Steam Isolation valves from the control board. (0.8)

QUESTION 3.02 (3.00)

a. What are four (4) of the six (6) functions of the Rod Control Start Up push button as described by System Description SD-007? (1.2)

b. What do the Rod Control System In-Out Lights indicate to the operator? (0.8)

c. What are two (2) specific signals induced by a dropped rod that will prevent rod motion? (1.0)

QUESTION 3.03 (3.00)

a. Describe how the Undervoltage and Underfrequency Low Flow Reactor trips actuate a reactor trip. Include logic. (1.2)

b. How are these two trips affected by P-7 and P-8 interlocks? (1.2)

c. What type core protection is provided by the above trips? (0.6)

QUESTION 3.04 (3.00)

a. What is the purpose of a Turbine Runback ? (1.0)

b. State the four (4) specific signals that will cause a Turbine Runback and indicate if the runback is caused by a load limit setback and/or a load reference setback. (2.0)

QUESTION 3.05 (2.60)

a. List the various signals provided by Control T-ave AND Protection T-ave. (1.6)

b. What are Narrow and Wide range loop pressure used for? (1.0)

QUESTION 3.06 (2.90)

a. Some Emergency Diesel ENGINE trips are by-passed when starting. List these specific trips and explain why they are bypassed. (2.0)

b. List the Emergency Diesel GENERATOR trips? (0.9)

QUESTION 3.07 (2.20)

a. What will cause automatic closure of:

1. Steam Generator blowdown sample valves. (0.6)
2. Steam Generator blowdown valves. (1.2)

b. How is the automatic closure of the blowdown valves defeated? (0.4)

QUESTION 3.08 (2.00)

Assume that all selectable control signals are selected to a Turbine First Stage Pressure Transmitter that fails low during full power operation. With all systems in automatic, describe the sequence of events if no operator action is taken. INCLUDE in your discussion the effects on the auto control circuits and their actions, the cause of reactor trips if the reactor trips and power response if the reactor does not trip. (2.0)

QUESTION 3.09 (3.50)

a. What 3 support system requirements must be met before a Main Feedwater pump will start? (0.9)

b. What 8 conditions will trip an operating Feed Pump? (1.6)

c. What is the predominate signal that controls the Feedwater regulating valves during steady state AND large load transient conditions? (1.0)

QUESTION 4.01 (3.20)

Explain why the following precautions or instructions from OP-301 "Charging and Volume Control" are necessary.

a. Letdown flow must be maintained below its alarm point of 130 gpm. (1.0)

b. When isolating letdown, close orifice isolation valves first, then close outside containment isolation valves. (1.0)

c. During pressurizer bubble formation, reduce charging pump speed and throttle down charging flow control valve. (1.2)

QUESTION 4.02 (2.20)

a. Explain how the Pressurizer Relief Tank (PRT) temperature is maintained below the maximum allowable. (1.0)

b. Where is the PRT drained to normally? During containment isolation conditions? (1.2)

QUESTION 4.03 (3.20)

a. Briefly explain how your procedure, OP-402, ensures that the Motor Driven Auxiliary Feed Pumps are not subjected to overload conditions. Specific numbers are not desired in the answer. (1.2)

b. What components on the Motor Driven and Turbine Driven Auxiliary Feed Pumps are supplied by service water? (1.0)

c. Name the two power sources, stating their nominal voltage and whether they are AC or DC, that must be available for normal operation of the Motor Driven pumps. Explain what the power is used for. Do not list power for interlocks or indication. (1.0)

QUESTION 4.04 (3.00)

a. If a Rod Position Indicator should fail during full power operation, what 3 instrument indications can be checked to see if the rod is remaining in it's proper position? (1.2)

b. What must the operator assume if a reactor trip occurs with a failed Rod Position Indicator? (0.8)

c. What automatic actions will occur if a full length rod indicator should indicate fully inserted? (1.0)

QUESTION 4.05 (3.40)

Assume a catastrophic failure of the Component Cooling Water system occurs due to a main line rupture. Answer the following in regards to AOP-12 "Loss of Auxiliary Cooling".

a. When would the operator be required to trip the reactor? (0.9)

b. What other operator action is required? (1.2)

c. Why does the procedure require that seal water flow to the Reactor Coolant Pumps be maintained? (0.4)

d. How is seal water flow maintained? (0.4)

→ e. How is cooldown below 200 degrees be accomplished? (0.5)

QUESTION 4.06 (1.65)

Match the symptoms in column "B" that an operator may see for the specific accident in column "A", according to procedure EOP-001 "Incident Involving Reactor Coolant Sys. Depress."

"A"	"B"
a. Loss of Reactor Coolant.	1. Abnormally low pressure in one or more S/G's.
b. Main Steam Line Break.	2. Main steam line radiation alarm.
c. S/G Tube Rupture.	3. Rising sump water level.
	4. Low pressurizer pressure and level.
	5. High containment pressure and temperature.
	6. MSIV's automatic closure. (1.65)

QUESTION 4.07 (2.85)

a. Indicate what Reactor Coolant System conditions you would maintain during sustained blackout conditions after a trip from full power. Explain your reasoning. (1.25)

b. What SYSTEM is used to supply water and what COMPONENTS are used to remove the heat. (0.6)

c. According to EOP-004 "Station Blackout Operation", what is the FIRST load you would start upon regaining power to one of the essential busses from a Diesel Generator? WHY? (1.0)

QUESTION 4.08 (3.20)

Assume it becomes necessary to evacuate the control room with the reactor at full power as indicated by EOP-009 "Control Room Inaccessability".

a. What are the operator's immediate actions? (0.8)

b. What are the 4 different methods of tripping the reactor? (1.2)

c. Where will an operator obtain a set of controlled keys for access to components outside the control room? Be specific as to location. (0.6)

d. Where can a copy of the procedure be obtained? (0.6)

QUESTION 4.09 (2.30)

a. Describe the action necessary to terminate a liquid release if automatic action does not occur on an alarm from R-18. (0.9)

b. Other than radio-active gas, what may cause an alarm on R-14 ? (0.7)

c. What is the primary hazard to personnel when a spent fuel assembly is dropped and ruptured in the refueling canal? (0.7)

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 1.01 (1.00)

Answer b. (1.0)

REFERENCE
H. B. Robinson General Procedures, GP-012, pp 2, 4

ANSWER 1.02 (1.50)

a. False (0.5)

b. True (0.5)

c. False (0.5)

REFERENCE
General Physics HT&FF Part A, Chapter 3, pp 122-126

ANSWER 1.03 ~~(2.00)~~ 1.5

a. Increase (0.5)

b. Brittle Fracture. (0.5)

c. The rates are based on composite curves and as such the most conservative case is on the heatup where the controlling analysis switches from the O.D. of the vessel to the I.D., whereas the cooldown analysis remains on the I.D. (0.5)

deleted wrong assumption used.

d. Metal Fatigue (0.5)

REFERENCE
H. B. Robinson Technical Specifications 3.1.2, pp 3.1-4 - 6 Amend 42

ANSWER 1.04 (2.00)

a. True
b. False
c. False
d. True [0.5 each] (2.0)

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

REFERENCE
General Physics HT&FF, Part A, Chapter 1, p. 285
Part B, Chapter 1, pp 319-321

ANSWER 1.05 (2.50)

a. Increase
b. Decrease
c. Increase
d. Decrease
e. Decrease [0.5 each] (2.5)

REFERENCE
General Physics HT&FF, Part B, Chapter 1, pp 137-159

ANSWER 1.06 (2.00)

a. Increase
b. Decrease
c. Decrease
d. Increase
e. Decrease [0.4 each] (2.0)

REFERENCE
General Physics HT&FF, Part B, Chapter 1, pp 324-332

ANSWER 1.07 (1.00)

a. Equal to (0.5)

b. Less negative than (0.5)

REFERENCE
H. B. Robinson RO Lesson Plans, RxTh-LP-32, p. 4
RxTh-LP-37, pp 8-9

ANSWER 1.08 (1.50)

a. answer is: 2 or 3 answer value would depend on value used for β (.006 to .0075) (1.0)

b. Higher (0.5)

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

REFERENCE
H. B. Robinson RO Lesson Plans, RxTh-LP-46
RxTh-LP-47

ANSWER 1.09 (2.50)

a. approx. 40 hours +-10 hours. (0.5)

b. Decreases (0.5)

c. No (0.5)

d. Xe: 8-12 hours
Sm: 12-16 days (1.0)

REFERENCE
H. B. Robinson RO Lesson Plans, RxTh-LP-37, pp 7,9
RxTh-Lp-38, p. 5
RxTh-TP-38.5

ANSWER 1.10 (.50)

Answer: d. (0.5)

REFERENCE
H. B. Robinson RO Lesson Plans, RxTh-LP-24

ANSWER 1.11 (1.00)

Greater Than [0.5];

RR = Macroscopic absorp. in fuel * Thermal Flux

since amount of fuel decreases the thermal flux must increase to maintain a constant RR [0.5] (1.0)

REFERENCE
H. B. Robinson RO Lesson Plan, RxTh-LP-9
RxTh-LP-47

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 1.12 (2.00)

a. Critical rod height - same for both
b. Power level - lower for S/U #1
c. SUR at criticality - higher for S/U #1 [0.33 each] (1.0)

REASONS:
a. Rod height dependent upon amount of reactivity needed for criticality. (0.5)
b. #1 S/U higher rod speeds do not allow for neutron pop. buildup as great as in S/U #2. (0.5)
c. #1 S/U will be higher due to higher react. addition rates. (0.5)

REFERENCE
H. B. Robinson RO Lesson Plan, RxTh-LP-41
RxTh-LP-45

ANSWER 1.13 (1.00)

Answer is: c.orb. (1.0)

REFERENCE
H. B. Robinson RO Lesson Plan, RxTh-LP-20
RxTh-LP-25

ANSWER 1.14 (1.00)

a. The gases contaminate the gap which reduces the thermal conductivity of the helium gas which raises the temperature of the fuel. (0.5)

b. Less Negative. (0.5)

REFERENCE
H. B. Robinson RO Lesson Plan, RxTh-LP-29, pp 4,5

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 1.15 (3.00)

a. Boron worths
Rod worths (control and shutdown 1/2 credit each)
Fission product poison worths
Power Defect
Isothermal Temperature defect [0.3 each] (1.5)

b. 1. 1% delta K/K
2. 10% delta K/K
3. 4% delta K/K [0.5 each] (1.5)

REFERENCE
H. B. Robinson RO Lesson Plan, RxTh-LP-50, pp 3 and 5
Technical Specifications 3.10.8.2
3.10.8.3

ANSWER 2.01 (1.50)

a. Manually block low pressurizer pressure and high steam line delta P signals. (0.5)

b. Manually block high steamline flow coincidence with low steam pressure or low Tave. (0.5)

c. Shut accumulator discharge valves. (0.5)

REFERENCE
H. B. Robinson System Description SD-002, p. 23

ANSWER 2.02 (2.50)

SUPPLY: Station Air [0.5]; primary [0.25]
Instrument air [0.5]

EXHAUST: Containment air exhaust [0.5]; primary [0.25]
Containment pressure relief [0.5] (2.5)

REFERENCE
H. B. Robinson System Description SD-039, pp 1-2

ANSWER 2.03 2.10 (~~2.40~~)

CVC-203 e,3

CVC-209 a,4

CVC-257 b,5

CVC-283 c, 1 drop 0.3 charging pump go to floor drain [0.3 each response] 2.1 (~~2.4~~)

REFERENCE
H. B. Robinson System Description SD-021, p. 29
Drawings 5379-685

ANSWER -2.04 (1.00)

Answer b or c. Conflict between System descriptions and Logic diagrams both answers could be given. (1.0)

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

REFERENCE
H. B. Robinson System Description SD-035, pp 34-36

ANSWER 2.05 (3.00)

a. Protective/Permissive outputs are BISTABLE outputs direct to the logic [0.25].
Control outputs are through ISOLATION AMPLIFIERS [0.25].

WHY-- isolation amps prevent feedback from none safety equipment effecting safety items [0.5]. (1.0)

b. 1. False
2. False
3. False
4. True
5. False [0.4 each] (2.0)

REFERENCE
H. B. Robinson System Description SD-010, pp 2,3,and 6
Drawing 5379-4571

ANSWER 2.06 (3.75)

a. A leak occurs, a radiation monitor on the suction header alarms and shuts the tank vent valve [0.5]. The level increases to fill the tank and a relief valve opens [0.5] to dump the excess water to the waste holdup tank [0.5]. (1.5)

b. 1. Pump A continues to operate. B trips. C would start if the low pressure alarm point is reached. (0.75)

2. A and B continue to operate. C trips and will NOT restart. (0.75)

3. A would trip and ~~auto~~ manually start start, B and C are tripped and will NOT restart. (0.75)

REFERENCE
H. B. Robinson System Description SD-013, pp 2-4

ANSWER 2.07 (2.50)

a. ~~4~~ a (Loops 2 and 3). (1.0)

b. Loop 3. (0.5)

c. 1. To reduce thermal stresses (shock) to the spray nozzle.
2. To maintain uniform water chemistry in the pressurizer.
3. to maintain unifrom temperature in the pressurizer.
[any 2 @ 0.5 each] (1.0)

REFERENCE
H. B. Robinson System Description SD-001, p. 4
Drawings 5379-1971

ANSWER 2.08 (1.85)

a. CATION (0.5)

b. 1. Containment isolation. [0.5]
~~2. Letdown isolation valve closes. [0.5]~~ not true (1.0)
accept #1 + any other answer

c. To ensure letdown is cooled (in the regenerative heat exchanger). (0.35)

REFERENCE
H. B. Robinson System Description SD-021, p. 7
Operating Procedures OP-301, p. 6
Drawings 5379-685

ANSWER 2.09 (3.50)

a. Allows for additional seal injection water flow through the pump bearing for cooling purposes [0.5]. Primary system pressure must be > 100 psig +-10 and < 1000 psig +-100 [0.5]. (1.0)

b. Diverted to the PRT via a relief valve. (when the relief valve setting is exceeded.) ~~CAF for additional details.~~ (1.0)

c. Decrease (0.5)

d. Ensure proper flow through No. 2 seal. (1.0)

REFERENCE
H. B. Robinson System Description SD-001, p. 18
General Procedures GP-001, p. 7
Drawing 5379-1971

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 2.10 (3.00)

a. What-To ensure seating of the check and discharge valves. (0.5)
WHY- To prevent back leakage in the system. (0.5)

b.

MOTOR		TURBINE	
2/3 det. on 1/3 S/G LO-LO Level		2/3 det. on 2/3 S/G LO-LO Level	
Both MFP breakers open		UV on 4160 V busses 1 and 4	
SI			
Blackout	[0.8]		[0.4] (1.2)

c. Condensate Storage Tank
Service Water
Deep well [0.2 each source, 0.2 order] (0.8)

REFERENCE
H. B. Robinson System Description SD-027, pp 22 and 23
Operating Procedure OP-402, p. 4

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 3.01 (2.80)

a. 1. cc.
2. aa.
3. bb. [0.4 each] (1.2)

b. 1. High-High containment pressure. (0.4)
2. High steam flow coincident with low T-ave or steam pressure (0.4)

c. 1. Individual control switch. (0.4)
2. Isolation push button. (0.4)

REFERENCE
WJE 127
H. B. Robinson System Descriptions, SD-006, pp.14,15

ANSWER 3.02 (3.00)

a. 1. Reset step counters.
2. Reset Master cycler.
3. Reset Slave cyclers.
4. Reset bank overlap counter.
5. Reset memory and alarm circuits.
6. Reset indicating system P/A converters. [any 4, 0.3 each] (1.2)

b. Rod motion has been REQUESTED [0.2] by manual control lever [0.3] or the T-ave control system.[0.3] (0.8)

c. 1. Rod bottom bistable (0.5)
2. NIS rod drop, 5% in 5 seconds (0.5)

REFERENCE
WJE 128
H. B. Robinson System Descriptions, SD-007, pp.10,12

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 3.03 (3.00)

a. Undervoltage on 2/3 RCP buses will actuate a protection system trip directly. [0.6] Underfrequency on 2/3 buses will cause all RCP breakers to trip, in turn causing a "Breaker Open" trip. [0.6] (1.2)

b. All trips are blocked below P-7 [0.6]. P-8 has no affect on ~~these~~ UF trips. [0.6]. (1.2)
P-8 will block a single UV Loss of RCP

c. DNB (0.6)

REFERENCE
WJE 129
H. B. Robinson System Description, SD-011, pp.9,10

ANSWER 3.04 (3.00)

a. (To act in coincidence with rod stops) to prevent reaching conditions that require a reactor trip. (1.0)

b. 1. NIS dropped rod----------Load limiter and reference
2. RPI dropped rod----------Load ~~reference~~ Limit
3. OP delta T----------Load reference
4. OT delta T----------Load reference [0.5 each] (2.0)

REFERENCE
WJE 130
H. B. Robinson System Description, SD-011, pp. 14,15

ANSWER 3.05 (2.60)

a.

Control T-ave	Protection T-ave	
Feedwater isolation	Steam flow SI	
Steam Dump	OP T delta	
Pressurizer level	OT T	
Rod control	High/Low alarms [0.2 each]	(1.6)

b. 1. Narrow range provides RHR interlocks. (0.5)
2. Wide range is for indication only. (0.5)

REFERENCE
WJE 131
H. B. Robinson System Description, SD-001, pp.29,30

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 3.06 (2.90)

a. 1. High crankcase pressure.[0.2] The crankcase is evacuated by the turbo-blower suction, which is not operating on an idle diesel.[0.3] (0.5)

2. Low lube oil pressure.[0.2] Pressure is provided by an engine driven attached pump which must first come up to speed.[0.3] (0.5)

3. Low jacket water pressure.[0.2] Water pressure is also provided by an attached pump.[0.3] (0.5)

4. High jacket water temperature.[0.2] A high temperature condition could exist immediatly after engine shutdown due to no flow conditions. the condition would clear when flow was initiated.[0.3] (0.5)

b. 1. Reverse power
2. Overcurrent
3. High Voltage [0.3 each] (0.9)

REFERENCE
WJE 132
H. B. Robinson System Description, SD-005, pp.12,13

ANSWER 3.07 (2.20)

a.(1) 1. Containment phase "A" isolation.
2. High radiation.
3. (Loss of power accepted, but not required) [0.2 each] (0.6)
4. Loss of Inst. A.C

(2) 1. Auto start of AFW pump. (This includes both Feed pumps, Safeguards Blackout, Low S/G level)
2. High radiation.
~~3. Loss of both feed pumps.~~
4. Phase "A" containment isolation. [0.3 each] (1.2)
Loss of power accepted, but not required
Loss of Inst. A.C

b. There are defeat switches for blocking auto starting of AFP's and closing of blowdown valves on the MCB. (0.4)

REFERENCE
WJE 133
H. B. Robinson System Description, SD-020, pp.4-6

Logic sheet #11

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 3.08 (2.00)

Steam Generator level will go to low programmed level due to loss of program signal [0.5]. The reference temperature signal will provide a no load temperature signal[0.5] and rods will insert to correct T-ave to no load temperature [0.5]. Plant will most likely trip (on low RCS pressure). If no trip occurs, turbine will shed load due to low steam pressure [0.5]. STM Dump affected, one case steam dump(2.0) armed, other case steam Dump Positioner gives open signal, either case steam dump valves do not open [0.4]

added at request of utility

REFERENCE
WJE 134
H. B. Robinson System Description, SD-011, p. 1
SD-025, pp 12, 13

ANSWER 3.09 (3.50)

a. 1. Condensate pump running.
   2. Minimum suction pressure.
   3. Lube oil pressure. [0.3 each] (0.9)

b. 1. Electrical overload
   2. Bus undervoltage
   3. Minimum flow (30 sec. TD)
   4. Loss of condensate pump
   5. Low suction pressure
   6. Low lube oil pressure
   7. Safeguards actuation
   8. High S/G level [0.2 each] (1.6)

c. 1. Steady state---------- Level error (0.5)
   2. Transient---------- Flow error (0.5)

REFERENCE
WJE 135
H. B. Robinson System Description, SD-027, pp. 12, 16

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 4.01 (3.20)

a. To prevent exceeding design flow rates of the demineralizers. (1.0)

b. To prevent lifting relief between orifice and containment isolation valves. (1.0)

c. Reduces charging flow as compared to letdown to begin bubble formation [0.6]. The flow control valve is throttled to ensure adequate flow to RCP seals.[0.6] (1.2)

REFERENCE
WJE 136
H. B. Robinson Operating Procedures, OP-301, pp. 6-8
System Description, SD-021, pp. 13, 33, 40, 41

ANSWER 4.02 (2.20)

a. By the addition of Primary water to cool the tank contents. (1.0)

b. Normally drained to RCDT, Pump Suction [0.6]. If containment isolation exists, it is drained directly to containment sump [0.6]. (1.2)

REFERENCE
WJE 137
H. B. Robinson Operating Procedures, OP-103, pp.2,3
Drawings 5379-920, SH.3; 5379-1971, SH.2

ANSWER 4.03 (3.20)

a. The flow rate is adjusted by manual positioning of the pump discharge valves[0.6] as RCS temperature changes.[0.6] (1.2)

b. Service Water supplies;

Motor Driven Pumps:
1. Seal water
2. Oil cooler (0.5)

Turbine Driven Pump:
1. Oil cooler (0.5)

c. 1. 480VAC[0.25] for pump motors and discharge valves.[0.25]
2. 125VDC[0.25] for control power.[0.25] (1.0)

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

REFERENCE
WJE 138
H. B. Robinson Operating Procedures, OP-402, pp. 1-3

ANSWER 4.04 (3.00)

a. 1. Power range detector currents
2. In-core detectors
3. Core outlet thermocouples [0.4 each] (1.2)

b. Assume the rod is fully withdrawn. (0.8)

c. Auto rod withdrawal stop [0.5] and turbine runback [0.5]. (1.0)

REFERENCE
WJE 139
H. B. Robinson Abnormal Operating Procedures, AOP-001, pp. 15-17

ANSWER 4.05 (3.40)

a. Procedure states that after 2 minutes [0.3] or when RCP bearings reach 200 degrees [0.3], stop the RCP'S [0.3]. (0.9)

b. Trip the turbine
Initiate Steam Dump action
Secure all three CCW pumps
Secure charging and letdown [0.3 each] (1.2)

c. To prevent high temperature coolant from destroying pump seals and causing LOCA. (0.4)

d. Alternate charging pumps at minimum speed. (0.4)

e. Install temporary piping and/or equipment as necessary to supply cooling water to RHR Heat Exchangers. (0.5)

REFERENCE
WJE 140
H. B. Robinson Abnormal Operating Procedures, AOP-012, pp. 3,4

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 4.06 (1.65)

a. ---------- 3, 4, 5, 6

b. ---------- 1, 3, 4, 5, 6

c. ---------- 2, 4 [0.15 each] (1.65)

REFERENCE
WJE 141
H. B. Robinson Emergency Operating Procedures, EOP-001, pp. 9, 10

ANSWER 4.07 (2.85)

a. Maintain no-load T-ave or greater [0.65]. Do not attempt to cooldown ~~as pressurizer level will decrease and there is no make-up available~~ to conserve water [0.6]. (1.25)

b. Use the Steam Driven Auxiliary Feed Pump to maintain S/G level [0.3] and REMOVE heat via S/G PORV's or condenser dump valves [0.3]. (accept either method of heat removal.) (0.6)

c. Charging pump [0.5], to restore pressurizer level and provide RCP seal water [0.5]. (1.0)

REFERENCE
WJE 142
H. B. Robinson Emergency Operating Procedures, EOP-004, pp. 3-5

ANSWERS -- ROBINSON -84/07/17-PICKER, B.

ANSWER 4.08 (3.20)

a. 1. Evacuate the MCR with all available 2-way portable radios. (0.4)
2. Assemble in the 4160 switchgear room to receive instructions from the Shift Foreman. (0.4)

b. 1. Open trip breakers in the Rod Control MG Set room.
2. Trip RDMG set motor ~~&~~ generators.
3. Trip RDMG's from 480 VAC busses.
4. Manually trip turbine. [accept any 4] [0.3 each] (1.2)

c. (Sealed) cabinet on the wall (immediatly to right of doorway) in the Fire Equipment Building. (0.6)

d. 4160 VAC Switchgear Room at the mimic bus panel. (0.6)

REFERENCE
WJE 143
H. B. Robinson Emergency Operating Procedures, EOP-009, pp. 1, 2

ANSWER 4.09 (2.30)

a. 1. Close ~~RCV-18~~ MOV WD-1785 at WDP.
2. Turn off any pump associated with release.
3. Manually close ~~RCV-18~~ WD-1785 if necessary. [0.3 each] (0.9)

b. ~~Overpressure on a gas decay tank.~~ electronic failure (0.7)

c. Exposure to of radio-active gasses. (0.7)

REFERENCE
WJE 144
H. B. Robinson Emergency Operating Procedures, EOP-005, p. 2
EOP-006, p. 1
EOP-007, p. 2