July 7, 2005

Dr. Ayman Hawari 2500 Stinson Drive North Carolina State University Post Office Box 7909 Raleigh, NC 27695-7909

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-297/OL-05-01, NORTH CAROLINA STATE UNIVERSITY

Dear Dr. Hawari:

During the week of May 16, 2005, the NRC administered an operator licensing examination at your North Carolina State University Reactor. The examination was conducted according to NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. Examination questions and preliminary findings were discussed with those members of your staff identified in the enclosed report at the conclusion of the examination.

In accordance with 10 CFR 2.390 of the Commission's regulations, a copy of this letter and the enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <u>http://www.nrc.gov/NRC/ADAMS/index.html</u>. The NRC is forwarding the individual grades to you in a separate letter which will not be released publicly. Should you have any questions concerning this examination, please contact Phillip Young at (301) 415-4094 or via internet e-mail pty@nrc.gov.

Sincerely,

/**RA**/

Patrick M. Madden, Section Chief Research and Test Reactors Section New, Research and Test Reactors Program Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

Docket No. 50-297

- Enclosures: 1. Initial Examination Report No. 50-297/OL-05-01
 - 2. Facility comments with NRC resolution
 - 3. Examination and answer key (RO)

cc w/encls: Please see next page

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TEMPLATE #: NRR-074

Docket No. 50-297

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cc w/encls: Please see next page

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EXAMINATION PACKAGE ACCESSION NO.: ML050770253 REPORT ACCESSION NO.: MI 051680404

C = COVER		E = C	OVER & ENCLOSURE		N = NO	СОРҮ
DATE	6/ 21/2005		6/ 28 /2005		7/ 6 /2005	
NAME	PYoung		EBarnhill		PMadden	
OFFICE	RNRP:CE		IROB:LA		RNRP:SC	

North Carolina State University

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Dr. Nino A. Masnari Dean of Engineering North Carolina State University P.O. Box 7909 Raleigh, NC 27695-7909

Test, Research, and Training Reactor Newsletter University of Florida 202 Nuclear Sciences Center Gainesville, FL 32611

U. S. NUCLEAR REGULATORY COMMISSION OPERATOR LICENSING INITIAL EXAMINATION REPORT

REPORT NO.:	50-297/OL-05-01	
FACILITY DOCKET NO.:	50-297	
FACILITY LICENSE NO.:	R-120	
FACILITY:	North Carolina State University	
EXAMINATION DATES:	May 18 – 20, 2005	
SUBMITTED BY:	/RA/ Phillip T. Young, Chief Examiner	<u>6/13 /05</u> Date

SUMMARY:

During the week of May 16, 2005, the NRC administered Operator Licensing examinations to seven reactor operator candidates. All seven candidates passed the written portion of the examination and five of the seven candidates passed the operating portion of the examination.

REPORT DETAILS

1. Examiners: Phillip T. Young, Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	7/0	0/0	7/0
Operating Tests	5/2	0/0	5/2
Overall	5/2	0/0	5/2

3. Exit Meeting:

Phillip Young, NRC, Examiner Larry Broussard, Chief Reactor Operator, PULSTAR Reactor, NCSU Kerry Kincaid, Chief Reactor Maintenance, PULSTAR Reactor, NCSU Andrew Cook, Associate Director, PULSTAR Reactor, NCSU

The examiner thanked the facility for their support in conducting the examinations. The following are areas where additional candidate training may be warranted: 1) radiation exposure limits; 2) radiation personnel monitoring equipment; 3) identification of equipment for filling and draining beam ports; and 4) location on the control rod drive of the servo that provides console rod position. The facility provided comments on three written examination questions which have been incorporated into the attached examination.

Facility Comments Regarding NRC Exam Administered on May 18, 2005

Question B.014

Facility Comment:No correct answer was provided in the answer key.NRC Resolution:Agree with comment. Question B.014 was deleted from the examination.

Question C.005

Facility Comment: We do not have the Neutron Radiography Facility or Prompt Gamma Facility. I have not updated the Data Summary, so there is no way you would know this.NRC Resolution: Agree with comment. Question C.005 was deleted from the examination.

Question C.007

Facility Comment:Portions a., b., e., and f. had multiple correct responses.NRC Resolution:Reviewed the information provided and recognized that the additional
responses were not envisioned during development. Question C.007
was deleted from the examination.

NORTH CAROLINA STATE UNIVERSITY



OPERATOR LICENSING EXAMINATION May 18, 2005

Enclosure 3

Question A.001 [1.0 point] (1)

A short reactor period is a greater hazard when reactor power is:

- a. Close to 100%
- b. Above the point of added heat (POAH)
- c. Below the POAH
- d. close to source counts

Answer: A.001 d.

Reference: Fundamentals of Nuc. Rx Eng./Nuclear Training Manual

Question A.002 [1.0 point] (2)

An initial count rate of 100 is doubled five times during startup. Assuming an initial Keff=0.950, what is the new Keff?

- a. 0.957
- b. 0.979
- c. 0.988
- d. 0.998

Answer: A.002 d.

Reference: Nuclear Training Manual - CR_1 (1-Keff₁) = CR_2 (1-Keff₂)

Question A.003 [1.0 point] (3)

Assume your reactor is being taken critical by periodically withdrawing equal reactivity control-rod increments. Which one of the following statements is correct as Keff approaches unity?

- a. The neutron level change for successive rod increment pulls becomes smaller.
- b. A longer period of time is required to reach the equilibrium neutron level after each rod withdrawal.
- c. If the rod withdrawal is stopped for several hours, the neutron level will decrease to source level.
- d. A rod withdrawal will result in the reactor becoming slightly supercritical, due to a "prompt jump", and then return to a subcritical level.

Answer: A.003 b.

Reference: Fundamentals of Nuclear Engineering pg. 117

Question A.004 [1.0 point] (4)

During a reactor startup, a stable positive 30 second reactor period is achieved with no further reactivity addition. The reactor is:

- a. exactly critical.
- b. supercritical.
- c. subcritical.
- d. prompt critical.

Answer: A.004 b.

Reference: Fundamentals of Nuclear Reactor Engineering Pg. 118, 120

Question A.005 [1.0 point] (5)

The PULSTAR is critical at 10 watts, ACP = 15.4" gang. Between 16.0" and 17.5" differential rod worth is 300 pcm/inch. What is the rod position required to maintain a constant reactor power if a -267 pcm sample is being inserted in the core?

- a. 18.36"
- b. 17.29"
- c. 14.51"
- d. 13.87"

Answer: A.005 b.

Reference: Nuclear Training Manual pg. RX 7-12

Question A.006 [1.0 point] (6)

The shutdown margin (SDM), upon full insertion of all control rods following a reactor scram from full power, is ______ the SDM immediately prior to the scram.

- a. equal to
- b. less than
- c. greater than
- d. independent of

Answer: A.006 a.

Reference: T.S 3.2a Bases

Question A.007 [1.0 point] (7)

An installed neutron source:

- a. provides a mean to allow reactivity changes to occur in a subcritical reactor.
- b. provides a neutron level that is detectable on the source range nuclear instrumentation.
- c. maintains the production of neutrons high enough to allow the reactor to achieve criticality.
- d. generates a sufficient neutron population to start the fission process and initiate subcritical multiplication.

Answer: A.007 b. Reference: FNRE pg. 112

Question A.008 [1.0 point] (8)

As criticality is approached during a reactor startup, equal insertions of positive reactivity result in a ______ absolute change in equilibrium count rate and a ______ time to reach each new equilibrium.

- a. smaller; shorter
- b. smaller; longer
- c. greater; shorter
- d. greater; longer

Answer: A.008 d.

Reference: FNRE pg. 118

Question A.009 [1.0 point] (9)

During a reactor startup, as Keff increases toward criticality, the value of 1/M:

- a. decreases toward zero.
- b. decreases toward one.
- c. increases toward infinity.
- d. increases toward one.

Answer: A.009 a.

Reference: FNRE pg. 124

Question A.010 [1.0 point] (10)

Upon reaching criticality during a reactor startup, the operator establishes a positive reactor period. Upon reaching the point of adding heat, the period will become ______ due to the ______ reactivity feedback of moderator and fuel temperature.

- a. shorter; negative
- b. shorter; positive
- c. longer; negative
- d. longer; positive

Answer: A.010 c.

Reference: FNRE Sect. V / Nuc. Trng. Man pg. RX 6-8

Question A.011 [1.0 point] (11)

Which ONE of the following statements correctly describes the influence of delayed neutrons on the neutron life cycle?

- a. Delayed neutrons decrease the average period of a reactivity addition because they thermalize more quickly than prompt neutrons.
- b. Delayed neutrons take longer to thermalize because they are born at higher energies than prompt neutrons.
- c. Delayed neutrons are born later than prompt neutrons and make up a larger fraction of the fission neutrons.
- d. Delayed neutrons cause the length of the average neutron generation time to increase.

Answer: A.011 d.

Reference: Nuclear Training Manual

Question A.012 [1.0 point] (12)

In a subcritical Rx, Keff is increased from 0.861 to 0.946. Which ONE of the following is the amount of reactivity that was added to the core?

- a. 0.085 þK/K
- b. 0.220 þK/K
- c. 0.104 þK/K
- d. 0.125 þK/K

Section A R Theory, Thermo & Fac. Operating Characteristics

Answer: A.012 c.

Reference: Nuclear Training Manual

Question A.013 [1.0 point] (13)

Which ONE of the following is a correct statement concerning the factors affecting control rod worth?

- a. Fuel burn up causes the rod worth for periphery rods to decrease.
- b. Fuel burn up causes the rod worth to increase in the center of the core.
- c. The withdrawal of a rod causes the rod worth of the remaining inserted rods to increase.
- d. As Rx power increases rod worth increases.

Answer: A.013 c.

Reference: Nuclear Training Manual

Question A.014 [1.0 point] (14)

The Rx is shutdown by 5% bK/K with a count rate of 100 cps on the start up channel. Rods are withdrawn until the count rate is 1000 cps. Which ONE of the following is the condition of the reactor after the rods are withdrawn?

- a. Critical with Keff = 1.0
- b. Subcritical with Keff = 0.995
- c. Subcritical with Keff = 0.950
- d. Supercritical with Keff = 1.005

Answer: A.014 b.

Reference: Nuclear Training Manual

Question A.015 [1.0 point] (15)

Which alteration or change to the core will most strongly affect the thermal utilization factor.

- a. Build up of fission products in fuel.
- b. Removal of moderator.
- c. Addition of 238U
- d. Removal of a control rod.

Answer: A.015 d. Reference: Nuclear Training Manual Question A.016 [1.0 point] (16)

Why does the effect on reactivity by the Fuel Temperature Coefficient (FTC) decrease as fuel temperature increases?

- a. The neutron energy resonance absorption peaks broaden less for the same degree of fuel temperature change.
- b. The water density decreases, causing the neutron resonance escape probability (p) to decrease.
- c. The neutron thermal utilization factor (f) predominates in its effect on the neutron life cycle.
- d. More neutrons leak out of the core.

Answer: A.016 a.

Reference: Nuclear Training Manual

Question A.017 [1.0 point] (17)

Which ONE of the following is the reason for the 80 second period following a Rx scram?

- a. U-235 affinity for source neutrons.
- b. Fuel temp. coefficient adding positive reactivity.
- c. Longest lived delayed neutron precursors decay constant.
- d. Amount of negative reactivity added on a scram exceeds the shutdown margin.

Answer: A.017 c.

Reference: Nuclear Training Manual

Question A.018 [1.0 point] (18)

Reactor power doubles in 0.66 minutes. Which ONE of the following is the time required for power to increase from 10 watts to 800 watts? (Assume a positive step change in reactivity.)

- a. 10.1 minutes
- b. 6.4 minutes
- c. 4.2 minutes
- d. 2.8 minutes

Answer: A.018 c.

Reference: Nuclear Training Manual

Question A.019 [1.0 point] (18)

The following facility parameters are given:

Primary coolant flow rate	> 1500 GPM
Secondary system flow rate	> 1400 GPM
Primary side delta-T across the heat exchanger	> 11 degrees F
Secondary side heat exchanger inlet temperature->	73 degrees F

Which one of the following is secondary side heat exchanger EXIT temperature.

- a. 82 degrees F
- b. 85 degrees F
- c. 89 degrees F
- d. 92 degrees F

Answer: A.019 b.

Reference: Nuclear Training Manual

Question A.020 [1.0 point] (20)

Which ONE of the following describes how the effective delayed neutron fraction varies over core life?

- a. Decreases due to the burnup of U-238
- b. Increases due to the burnup of U-238
- c. Decreases due to the buildup of PU-239
- d. Increases due to the buildup of PU-239

Answer: A.020 c.

Reference: Nuclear Training Manual

***** END OF SECTION A B THEORY, THERMO & FAC. OPERATING CHARACTERISTICS*****

Question B.001 [2.0 points, 0.4 each] (2)

Match the values from column B for the Technical Specification limits listed in column A. (Values in Column B may be used more than once or not at all. Each limit in section A should have only one answer.)

<u>Co</u>	lumn A	<u>Column B</u>	
a.	Minimum Shutdown margin provided by the remaining control rods with the highest worth scrammable rod fully withdrawn, the shim	0.1% ∆k/k	
	rod fully withdrawn, experiments in their most reactive condition , relative to the Cold Critical condition		
6		1.0% ∆k/k	
D.	I otal Maximum Reactivity worth of all experiments.	2.9% ∆k/k	
C.	Maximum Excess Reactivity	2 00/ 11/14	
d.	Maximum rate of reactivity insertion (per second, critical region only).	3.9% ДК/ К	
e.	Maximum absolute worth of Non-Secured Experiment.		

Answer:	B.001	a. = 0.4;	b. = 2.9;	c. = 3.9	d. = 0.1;	e. = 1.0
Reference	:	Technical Spe	ecification 3.2 F	Reactivity		

Question B.002 [1.0 point] (3)

Which ONE of the following is the correct definition of a **CHANNEL CHECK**?

- a. The introduction of a signal into the channel for verification that it is operable.
- b. The combination of sensor, line, amplifier, and output devices which are connected for the purposes of measuring the value of a parameter.
- c. An adjustment of the channel such that its output corresponds with acceptable accuracy to known values of the parameter which the channel measures.
- d. A qualitative verification of acceptable performance by observation of channel behavior. This verification, where possible, shall include comparison of the channel with other independent channels or systems measuring the same variable.

Answer: B.002 d.

Reference: Technical Specifications § 1, Definitions

Question B.003 [1.0 point] (4)

The **Quality Factor** is used to convert ...

- a. dose in rads to dose equivalent in rems.
- b. dose in rems to dose equivalent in rads.
- c. contamination in rads to contamination equivalent in rems
- d. contamination in rems to contamination equivalent in rads

Answer: B.003 a.

Reference: 10CFR20.1004.

Question B.004 [2.0 points, ¹/₂ each] (6)

Identify each of the listed requirements as a Safety Limit (SL) a Limiting Safety System Setting (LSSS) or a Limiting Condition for Operation (LCO).

- a. Maximum of 25 fuel assemblies.
- b. Minimum height of water above the core of 14 feet, 2 inches.
- c. The True value of reactor coolant inlet temperature shall not be greater than 120EF.
- d. N¹⁶ Power Measuring channel is operable.

Answer:B.004a. = LCO;b. = LSSS;c. = SL;d. = LCOReference:Technical Specifications 2.1, 2.2, 3.1 and 3.4

Question B.005 [1.0 point] (7)

The minimum level of review for a "Tried Experiment" is

- a. DSRO and DHP
- b. CRO and RHP
- c. ROM and RHP
- d. ROM, RHP and RSAC

Answer: B.005 c. Reference: Technical Specification 6.4.2 Question B.006 [1.0 point] (8)

Fill in the blank: According to Technical Specifications, the "designated Senior Operator (DSRO) is considered on call if: ...is capable of getting to the reactor facility within a reasonable time under normal conditions e.g., _____ minutes ...

- a. 15
- b. 30
- c. 45
- d. 60

Answer: B.006 b.

Reference: Technical Specification 6.1.2

Question B.007 [1.0 point] (9)

Which ONE of the materials listed is required to doubly encapsulated prior to irradiation per Technical Specifications?

- a. Explosive
- b. Corrosive
- c. Fueled
- d. Cryogenic

Answer: B.007 b.

Reference: Technical Specifications 3.7 and 3.8.

Question B.008 [1.0 point] (10)

The Emergency Director (ED) must approve all emergency exposures in excess of ...

- a. 1 Rem
- b. 5 Rem
- c. 10 Rem
- d. 25 Rem

Answer: B.008 b.

REF: Emergency Plan § 7.5.7 *Personnel Exposure Guidelines,* p. 18.

Question B.009 [1.0 point] (11)

In order to work on energized electrical circuits you must obtain permission from either the Chief or Reactor Maintenance or ...

- a. Designated SRO
- b. Associate Director
- c. Chief Reactor Operator
- d. Reactor Operations Manager

Answer: B.009 d.

Reference: POM, Section 2 Administrative Controls § 2.9.4, p. 2-17.

Question B.010 [1.0 point] (12)

Which ONE of the following positions represents the MINIMAL level of authority required to approve TEMPORARY changes to the Operations Manual that do not change their original intent?

- a. Associate Director
- b. Chief Reactor Operator
- c. Radiation Protection Council
- d. Reactor Operations Manager

Answer: B.010 a. Reference: POM pg. 2-3

Question B.011 [1.0 point] (13)

10 CFR 20.105 sets "permissible" levels of radiation in unrestricted areas. What is the 10 CFR 20 whole body MAXIMUM dose limit, in any period of one calendar year in an "unrestricted" area?

- a. 1.25 Rem
- b. 500 mrem
- c. 200 mrem
- d. 100 mrem

Answer: B.011 b.

Reference: 10 CFR 20

Question B.012 [1.0 point] (14)

After a "RWP" has been issued, which ONE of the following signatures is not required before work can begin?

- a. Person in charge of work
- b. Reactor Health Physicist
- c. Chief of Reactor Maintenance
- d. Reactor Operations Manager

Answer: B.012 c.

Reference: HP Procedure HP-10-3

Question B.013 [1.0 point] (15)

When removing irradiated samples from the pool when is Health Physics personnel presence required?

- a. Health Physics personnel monitoring is always required.
- b. Reactor Operators may at any time remove irradiated materials from the pool without assistance.
- c. Health Physics personnel monitoring is required if dose rate one foot from the pool surface exceed 100 mr/hr.
- d. Health Physics personnel assistance is never required when a Certified VEP sample handler is performing the task.

Answer: B.013 c.

Reference: HP 40-1

DELETED DUE TO FACILITY COMMENT Question B.014 [1.0 point] (16)

Which ONE of the following statements is TRUE?

- a. When the Pulstar Reactor is operating,tour groups may be admitted to the Bridge if permission has been obtained from a Health Physics personnel.
- All pregnant members of tour groups should be advised of the prenatal limit of 0.5 Rem exposure during the 9 month gestation.
- C. Visitors 14 to 18 years of age shall not be admitted to a Restricted area in which the dose rate exceeds 2 mR/hr.

d. Visiting family members may be taken to the Bay floor only if they are over 18 years old.

Answer: B.014 c.

Reference: HP 30-1

Question B.015 [1.0 point] (17)

Which one of the following experiments is "secured"?

- a. The experiment is attached by a mechanical device.
- b. The experiment can only be moved by a force of 100 lbs or greater.
- c. The experiment is held in place by gravity and cannot be moved by less than 100 lbs.
- d. The experiment is attached by a mechanical device and a force greater than 100 lbs is required to move it.

Answer: B.015 d.

Reference: NCSU Tech. Spec.

Question B.016 [1.0 point] (18)

Which ONE of the following conditions would cause a 1/M curve to predict criticality earlier than it will actually occur?

- a. Source loaded too near detector
- b. Highest worth fuel assemblies loaded first
- c. Fuel assemblies loaded too far from detector
- d. Control rod located between fuel assemblies loaded and detector

Answer: B.016 b.

Reference: Nuclear Trng. Manual

Question B.017 [1.0 point] (19)

The reactor is operating at 1 MW in Automatic Control. The Reactor Operator receives a request for a rabbit experiment of 25 pcm worth. Which ONE of the following best describes the actions required by the RO during the irradiation?

- a. Place the reactor in manual prior to inserting the sample.
- b. Consider possible effects on SDM. Start the pneumatic blower. Log the sample out of the core.
- c. Check the sample classification and estimated reactivity. Shutdown the reactor prior to loading the sample.
- d. Check the sample estimated reactivity and effects on SDM. Reduce Rx power to approximately 950 KW prior to inserting the sample.

Answer: B.017 d.

Reference: ROP Sect. 3 pg 3-47

Question B.018 [1.0 point] (20)

An irradiated sample having a half-life of 3 minutes provides a dose rate of 200 mr/hr at 3 ft. approximately how far from the sample must a Radiation Area sign be posted?

- a. 5 ft.
- b. 8 ft.
- c. 20 ft.
- d. 50 ft.

Answer: B.018 c.

Reference: 10CFR20

***END OF SECTION B NORMAL/EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS**

Question C.001 [2.0 points, $\frac{1}{2}$ each] (2)

Match the core materials listed in column A with their primary purpose in column B.

	Column A		Column B
a.	Zircaloy	1.	Reflector
b.	Beryllium	2.	Cladding
C.	silver-indium-cadmium alloy	3.	Poison
d.	Graphite		
Answe	er: C.001 a. = 2; b. = 1; c. = 3; ence: SAR Chapter 3 Reactor, §§ 3 Core #4.	3.2.	d. = 1 2.4, 3.2.2.5, also PULSTAR Data Summary II, Reflected
Quest	ion C.002 [1.0 point] (3.0)		

To minimize the production of Ar^{41} , a _____ purge gas is connected to the pneumatic transfer system, when operating above 500 Kw for longer than 10 minutes. (Fill in the blank)

- a. H_2
- b. He
- c. CO_2
- d. N₂

Answer: C.002 d.

Reference: Pulstar Operations Manual § 9.2.4, Pneumatic Nitrogen Purge System

Question C.003 [1.0 point] (4)

A facility Evacuation signal will also cause an automatic confinement initiation. In Confinement, the Heating & Ventilation fans...

- a. must be manually secured, but the confinement fans start automatically.
- b. automatically secure, but the confinement fans must be started manually.
- c. automatically secure, and Confinement Fan #1 automatically starts immediately.
- d. automatically secure, and **BOTH** of the confinement fans automatically start immediately.

Answer: C.003 c. Reference: POM § 8.2.5.

Question C.004 [1.0 point] (5)

Which ONE of the following statements is true?

- a. The primary pump must be operating for the secondary pump to operate.
- b. The secondary pump must be operating for the primary pump to operate.
- c. The secondary pump must be operating for the cooling tower fans to operate.
- d. The cooling tower fans must be operating for the secondary pump to operate.

Answer: C.004 c. Reference: POM, § 5.2

DELETED DUE TO FACILITY COMMENT Question C.005 [2.0 points, ½ each] (7)

Match each Beam Tube listed in column B with the correct description from column A.

	Column A	Column B
a.	6" circular thru-tube	1
b.	Contains Neutron Radiography Facility	2
<u>с.</u>	Contains Prompt Gamma Facility	
d.	12' square beam tube	4
		5
		6

Answer: C.005 a. = 2; b. = 4; c. = 5; d. = 6 Reference: POM, § 9.4, also, Figure 8 from Pulstar Data Summary vol. II. p. 17.

Question C.006 [1.0 point] (8)

On a loss of commercial power which ONE of the following components CANNOT receive power from the auxiliary generator?

- a. Confinement Fan #1
- b. Confinement Fan #2
- c. VAMP Area Radiation Monitor
- d. Control Room Distribution Panel

Answer: C.006 c.

Reference: POM § 6

DELETED DUE TO FACILITY COMMENT Question C.007 [2.0 points, ¹/₃ each] (10) Indicate whether each of the primary/purification system parameters listed in column A provides Indication Only (I); an Alarm (without a scram) (A); or a SCRAM (automatic) (S).

- a. Resistivity
- b. Temperature
- c. Pressure
- d. Radioactivity (N¹⁶-monitor)
- e. Water Level
- f. Flow

Answer: C.007 a. = A; b. = A; c. = I; d. = I; e. = S; f. = S

Reference: POM, § 5.1.4

Question C.008 [1.0 point] (11)

Which ONE of the following describes how the Auxiliary Generator supply breaker is closed following a loss of commercial power and the generator is started from the Control Console?

- a. As the generator comes up in speed and voltage reaches 80% of rated it automatically closes the switch.
- b. As the generator comes up in speed and voltage, the generator voltage works against the spring to close the switch.
- c. As the generator comes up to rated speed a time delay times out applying power to the closing relay to close the switch
- d. As the generator comes up to rated voltage a contact closes applying power to the closing relay to close the switch.

Answer: C.008 b.

Reference: NCSU Operating Manual sect. 6.2.2 pg. 6.9

Question C.009 [1.0 point] (12)

The primary to secondary heat exchanger develops a tube leak. Which ONE of the following conditions will result in a loss of reactor coolant to the secondary cooling system?

- a. Primary pump I/S Secondary pump O/S Reactor secured
- b. Primary pump I/S Secondary pump I/S Reactor operating at 1.0 MW
- c. Primary pump O/S Secondary pump O/S Reactor at 50 KW
- d. Primary pump O/S Secondary pump I/S Reactor at 125 KW

Answer: C.009 a.

Reference: POM Sect. 5 pg. 5-7

Question C.010 [1.0 point] (13)

Which ONE of the following statements concerning confinement fans is TRUE?

- a. If confinement Fan #1 fails to start manually, Confinement Fan #2 will self-energize.
- b. TWO confinement fans are required to achieve negative air pressure in the Reactor Building.
- c. To start one of the confinement fans manually the main Heating and Ventilation system must be off.
- d. Switch disconnect for Confinement Fan #1 must be opened in order to connect the Aux. Distribution panel to the Aux Generator.

Answer: C.010 c.

Reference: POM Sect. 8 pg. 8-8

Question C.011 [1.0 point] (14)

Concerning fuel handling, which ONE of the following statements is TRUE?

- a. Loading fuel into a water hole or "U" is never permitted.
- b. The magnet current of control rods should be decreased to less than 40 mA prior to fuel movements.
- c. Unless special conditions (determined by RHP) exist, a Radiation Work Permit is not required for fuel handling evolutions.
- d. Having the Designated Senior Reactor Operator as the fuel handler and a Reactor Operator Assistant as the numbering and orientation observer meets the minimum required two person fuel handling crew.

Answer: C.011 c.

Reference: PULSTAR Special Procedure 3.2

Question C.012 [1.0 point] (15)

Which of the following statements describes the signal path from the Startup Channel detector to the level (cps) meter on the console?

a.	Detector,	Pre Amp,	Discriminator,	Log Integrator,	Meter
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- b. Detector, Log Integrator, Pulse Shaper, Pulse Counter, Meter
- c. Detector, Pre Amp, Log Integrator, Discriminator, Meter
- d. Detector, Log Amp, Meter

Answer: C.012 a.

Reference: NCSU POM Sect. 4, pg. 4-2 & 3

Question C.013 [1.0 point] (16)

Which ONE of the following statements describes the reactor instrumentation and protection channels response to a High failure of the regulator supplying the flow measuring channel?

- a. Low flow indication and low flow scram at 475 gpm if greater than 150 kw.
- b. High flow indication and low flow scram signal.
- c. High reactor coolant flow indication
- d. No effect.

Answer: C.013 b.

Reference: POM Sect. 4 pg. 4-12

Question C.014 [1.0 point] (17)

Which ONE of the following load cannot be supplied by the Auxiliary Distribution panel?

- a. Primary pump motor
- b. Confinement Fan #1
- c. Confinement Fan #2
- d. Reactor Console

Answer: C.014 a. Reference: POM Sect. 6 pg. 6-7

Question C.015 [1.0 point] (18)

To satisfy the Control Rod Drives Interlocks, which ONE of the following inputs requires that the reactor keyswitch be "ON" ?

- a. Individual Magnet power
- b. Ganged up-drive power bus
- c. Ganged down-drive power bus
- d. Individual Drive Motor power line

Answer: C.015 a.

Reference: POM Sect. 4 pg. 4-20/Fig. 4.4

Question C.016 [1.0 point] (19)

What type of detector does the N-16 channel use?

- a. SEMIRAD burst
- b. Compensated ion chamber
- c. Uranium lined, fission chamber
- d. Xenon filled ionization chamber

Answer: C.016 d.

Reference: POM Sect. 4 pg. 4-8

Question C.017 [1.0 point] (20)

Which ONE of the following will NOT be affected by a failure of the Linear Power channel High Voltage Power Supply (HVPS)?

- a. Flow/Flapper scram enable
- b. Control Rod Reverse Drive
- c. Automatic Power Controller
- d. Linear Channel Overpower SCRAM

Answer: C.017 a.

Reference: POM Sect. 4 Fig. 4.1

END OF SECTION C FACILITY AND RADIATION MONITORING SYSTEMS

END OF WRITTEN EXAMINATION

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