June 2, 2009

Mr. Terence Tehan, Director
Rhode Island Atomic Energy Commission
Rhode Island Nuclear Science Center
16 Reactor Road
Narragansett, RI 02882-1165

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-193/OL-09-01,
RHODE ISLAND ATOMIC ENERGY COMMISSION

Dear Dr. Tehan:

During the week of April 6, 2009, the Nuclear Regulatory Commission (NRC) administered operator licensing examinations at your Rhode Island Atomic Energy Commission reactor. The examinations were conducted according to NUREG-1478, "Operator Licensing Examiner Standards for Research and Test Reactors," Revision 2. 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 Title 10 of the *Code of Federal Regulations* Section 2.390, 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 http://www.nrc.gov/reading-rm/adams.html. 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 Mr. Phillip T. Young at (301) 415-4094 or via internet e-mail Phillip.Young@nrc.gov.

Sincerely,

/RA/

Johnny H. Eads Jr., Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-193

Enclosures:
1. Initial Examination Report No. 50-193/OL-09-01
2. Written examination

cc w/out encls: See next page

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DATE	04/28/2009		05/05/2009		06/02/2009

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cc:

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

REPORT NO.: 50-193/OL-09-01

FACILITY DOCKET NO.: 50-193

FACILITY LICENSE NO.: R-95

FACILITY: RHODE ISLAND ATOMIC ENERGY COMMISSION

EXAMINATION DATES: April 7, 2009

SUBMITTED BY: ***/RA/*** 04/21/2009
Phillip T. Young, Chief Examiner Date

SUMMARY:

During the week of April 6, 2009, the NRC administered operator licensing examinations to one Senior Operator candidate. The candidate failed one section of the written examination and passed all portions of the operating examination

REPORT DETAILS

1. Examiners: Phillip T. Young, Chief Examiner, NRC

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	0/0	0/1	0/1
Operating Tests	0/0	1/0	1/0
Overall	0/0	0/1	0/1

3. Exit Meeting:
Phillip T. Young, Chief Examiner, NRC
Dr. Terence Tehan, Director
Jeff Davis, Reactor Supervisor

The NRC examiner thanked the facility staff for their cooperation during the examination. The examiner reported no generic weaknesses.

ENCLOSURE 1

RHODE ISLAND
ATOMIC ENERGY COMMISSION

Operator License Examination

Written Exam with Answer Key

April 6, 2009

ENCLOSURE 2

Question A.001 [1.0 point] {1.0}
A reactor with an initial population of 24000 neutrons is operating with K_{eff} = 1.01. Of the CHANGE in population from the current generation to the next generation, how many are prompt neutrons?

a. 24

b. 238

c. 240

d. 24240

Answer: A.001 b.
Reference: 24000 neutrons in current generation
1.01 = 24240 neutrons in next generation
240 neutrons added - 0.7% delayed neutron fraction = 238 prompt Neutrons added

Question A.002 [1.0 point] {2.0}
The following data was obtained during a reactor fuel load.

No. of Elements	Detector A (cps)
0	60
6	80
12	120
18	400
22	1200

Which one of the following is the closest number of fuel elements required to make the reactor critical? (The attached figure may be used to determine the correct response.)

a. 18

b. 22

c. 24

d. 26

Answer: A.002 c.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1982, § 5.5, pp. 5-18 — 5-25.

Question A.003 [1.0 point] {3.0}
Which one of the following will be the resulting stable reactor period when a $0.25 reactivity insertion is made into an exactly critical reactor core?

a. 18 seconds
b. 30 seconds
c. 38 seconds
d. 50 seconds

Answer: A.003 b.
Reference: Glasstone, S. and Sesonske, A, *Nuclear Reactor Engineering,* 1991, § 5.18, p. 234.
$T = (\beta-\rho)/\lambda\rho$ $T = (.0070 - .00175)/.1 \times .00175 = 30$ seconds

Question A.004 [1.0 point] {4.0}
A control rod was withdrawn two (2) inches. The steady reactor period following rod withdrawal is observed to be sixty (60) seconds.

Which one of the following is the differential rod worth?

a. 1.0×10^{-3} delta k/k per inch
b. 5.6×10^{-3} delta k/k per inch
c. 1.12×10^{-4} delta k/k per inch
d. 5.0×10^{-4} delta k/k per inch

Answer: A.004 d.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, § 7.2 & 7.3, pp. 7-1 — 7-9.
$\rho = 0.007/((0.1 * 60) + 1) = 0.007/7$ $\rho = 1 \times 10^{-3}$ delta k/k
ρ/inch = 1×10^{-3} delta k/k/2 inches = 5.0×10^{-4} delta k/k per inch

Question A.005 [1.0 point] {5.0}
The reactor is operating at 100 KW. The reactor operator withdraws the control rod allowing power to increase. The operator then inserts the same rod to its original position, decreasing power. In comparison to the rod withdrawal, the rod insertion will result in:

a. a slower period due to long lived delayed neutron precursors.

b. a faster period due to long lived delayed neutron precursors.

c. the same period due to equal amounts of reactivity being added.

d. the same period due to equal reactivity rates from the rod.

Answer: A.005 a.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1982, §§ 3.2.2 — 3.2.3, pp. 3-7 — 3-12.

Question A.006 [1.0 point] {6.0}
Following a significant reactor power increase, the moderator temperature coefficient becomes increasingly more negative. This is because:

a. a greater density change per degree F occurs at higher reactor coolant temperatures.

b. the core transitions from an under-moderated condition to an over-moderated condition.

c. as moderator density decreases, less thermal neutrons are absorbed by the moderator than by the fuel.

d. the change in the thermal utilization factor dominates the change in the resonance escape probability.

Answer: A.006 a.
Reference: DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory Volume 2, Module 3, Enabling Objective 2.4, p. 26.

Question A.007 [1.0 point] {7.0}
Which one of the following is the principal source of heat in the reactor after a shutdown from extended operation at 100 KW?

a. Production of delayed neutrons
b. Subcritical reaction of photo-neutrons
c. Spontaneous fission of U^{238}
d. Decay of fission fragments

Answer: A.007 d.
Reference:DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory Volume 1, Module 1, Enabling Objective 4.9, p. 61.

Question A.008 [1.0 point] {8.0}
A reactor is critical at 1 Watt. Subsequent rod motion causes a power increase at an indicated period of 30 seconds. Reactor power 2 minutes later will be approximately:

a. 55 Watts
b. 35 Watts
c. 15 Watts
d. 5 Watts

Answer: A.008 a.
Reference: $P=P_o e^{t/\tau} = 1e^{120sec/30sec} = 54.6$

Question A.009 [1.0 point] {9.0}
Reactor A increases power from 10% to 20% with a period of 50 seconds. Reactor B increases power from 20% to 30% with a period of also 50 seconds. Compared to Reactor A, the time required for the power increase of Reactor B is:

a. longer than A.
b. exactly the same as A.
c. twice that of A.
d. shorter than A.

Answer: A.009 d.

Reference: The power of reactor A increases by a factor of 2, while the power of reactor B increases by a factor of 1.5. Since the periods are the same (rate of change is the same), power increase B takes a shorter time.

Question A.010 [1.0 point] {10.0}
Following a scram, the value of the stable reactor period is:

a. approximately 50 seconds, because the rate of negative reactivity insertion rapidly approaches zero.

b. approximately -10 seconds, as determined by the rate of decay of the shortest lived delayed neutron precursors.

c. approximately -80 seconds, as determined by the rate of decay of the longest lived delayed neutron precursors.

d. infinity, since neutron production has been terminated.

Answer: A.010 c.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1982, § 4.6, p. 4-16.

Question A.011 [1.0 point] {11.0}
Which one of the following describe the difference between a moderator and reflector?

a. A reflector increases the fast non-leakage factor and a moderator increases the thermal utilization factor.

b. A reflector increases the neutron production factor and a moderator increases the fast fission factor.

c. A reflector decreases the thermal utilization factor and a moderator increases the fast fission factor.

d. A reflector decreases the neutron production factor and a moderator decreases the fast non-leakage factor.

Answer: A.011 a.
Reference: Glasstone & Sesonke, Nuclear Reactor Engineering, Chapter 1

Question A.012 [1.0 point] {12.0}
During the neutron cycle from one generation to the next, several processes occur that may **increase** or decrease the available number of neutrons.

SELECT from the following the six-factor formula term that describes an INCREASE in the number of neutrons during the cycle.

a. Thermal utilization factor.

b. Resonance escape probability.

c. Thermal non-leakage probability.

d. Fast fission factor.

Answer: A.012 d.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1982, Subcritical Multiplication

Question A.013 [1.0 point] {13.0}
Which one of the following describes the MAJOR contribution to the production and depletion of xenon in the reactor?

a. Produced from radioactive decay of iodine and depletes by radioactive decay and neutron absorption

b. Produced directly from fission and depletes by radioactive decay and neutron absorption

c. Produced from radioactive decay of iodine and depletes by neutron absorption only

d. Produced directly from fission and depletes by neutron absorption only

Answer: A.013 a.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, §§ 8.1 —8.4, pp. 8-3 — 8-14.

Question A.014 [1.0 point] {14.0}
A subcritical reactor is being started up. A control rod is raised in four equal steps. Which statement most accurately describes the expected reactor response?

a. Power increases by the same amount for each withdrawal.
b. Each withdrawal will add the same amount of reactivity.
c. The time for power to stabilize after each successive withdrawal increases.
d. A lower critical rod height is attained by decreasing the time intervals between withdrawals.

Answer: A.014 c.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1982, Subcritical Multiplication

Question A.015 [1.0 point] {15.0}
The T.S. require a minimum Shutdown Margin (SDM) of 1.0 %ΔK/K for a specific core and control rods configuration. Assuming no experiment in the core, Xenon free conditions, and the following worth's:

	worth %ΔK/K
Shim-Safety Blade #1:	2.41
Shim-Safety Blade #2:	2.32
Shim-Safety Blade #3:	2.49
Shim-Safety Blade #4:	2.60
Regulating rod:	0.084
Excess Reactivity:	3.42

Which one of the following is the calculated SDM?

a. 9.90%
b. 6.48%
c 6.40%
d. 3.80%

Answer: A.015 d.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 6.2.3 p. 6-4. & RINSC Training Manual - Pg. I-54 & T.S. 3.1
SDM (cold/clean) = Total Rod worth - K_{excess} - Most reactive blade - Reg Rod
SDM = (2.41 + 2.32 + 2.49 + 2.60 + 0.084) - 3.42 - 2.60 - 0.084 = 3.80%

Question A.016 [1.0 point] {16.0}
Which one of the following describes how delayed neutrons affect control of the reactor?

a. More delayed neutrons are produced than prompt neutrons resulting in a longer time to reach a stable subcritical countrate.

b. Delayed neutrons are born at higher energies than prompt neutrons resulting in a shorter reactor period from increased leakage.

c. Delayed neutrons take longer to thermalize than prompt neutrons resulting in a longer reactor period.

d. Delayed neutrons increase the average neutron lifetime resulting in a longer reactor period.

Answer: A.016 d.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988

Question A.017 [1.0 point] {17.0}
Assume that reactor power is 50% and equilibrium Xenon is attained. Reactor power is then increased to 100%. Which one of the following correctly describes the new equilibrium Xenon value?

a. The 100% equilibrium xenon is half the 50% value

b. The 100% equilibrium xenon is equal to the 50% value.

c. The 100% equilibrium xenon is twice as high as the 50% value.

d. The 100% equilibrium xenon is higher than the 50% value but not twice as high.

Answer: A.017 d.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988,
§§ 8.2 — 8.4, pp. 8-3 — 8-14, Fig. 8-2

Question A.018 [1.0 point] {18.0}
The term "prompt jump" refers to:

a. the instantaneous change in power due to raising a control rod.

b. a reactor which has attained criticality on prompt neutrons alone.

c. a reactor which is critical using both prompt and delayed neutrons.

d. a negative reactivity insertion which is less than Beta-effective.

Answer: A.018 a.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988

Question A.019 [1.0 point] {19}
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. 0.090 delta-K/K
b. 0.220 delta-K/K
c. 0.104 delta-K/K
d. 0.125 delta-K/K

Answer: A.019 c.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 3.3.4, p. 3-21.

Question A.020 [1.0 point] {20.0}
With a 30 second period, power would double in approximately:

a. 15 seconds
b. 21 seconds
c. 30 seconds
d. 60 seconds

Answer: A.020 b.
Reference: Glasstone, Nuclear Reactor Engineering, Chapter 5, Section 5.18

Question B.001 [1.0 point] {1.0}
Which one of the following statements is TRUE concerning experiments?

a. Samples measuring >200 mrem/hr on contact are not allowed out of the reactor room without special permission.

b. The reactivity worth of any experiment NOT fixed in place shall not exceed 0.6% ΔK/K.

c. The reactivity insertion rate of experiments will not exceed 0.02 % ΔK/K.

d. The reactivity worth of all experiments shall NOT exceed 3.0% ΔK/K.

Answer: B.001 a.
Reference: Technical Specification 3.1 &
Procedures for Dispatching and Receiving Rabbits, pg. 12-4

Question B.002 [1.0 point] {2.0}
The secondary circulating pump fails while the reactor is at 100% power with all rods in manual control. Assume that all systems operate normally and no operator action is taken. Which one of the following is the expected outcome?

a. Low flow alarm on the secondary coolant system. Reactor power stays at 100%.

b. Primary coolant inlet temperature increases to the scram setpoint and the reactor scrams.

c. Primary coolant exit temperature goes up to alarm setpoint and scrams the reactor at the scram setpoint.

d. Pool inlet temperature increases. Reactor power decreases due to the negative temperature coefficient. An equilibrium is reached and reactor power stays at around 95%.

Answer: B.002 c.
Reference: Technical Specification, p. 12, Table F-1. & Rhode Island: Safeguards Report for Rhode Island Open Pool Reactor, paragraph 2.2.3, p. 26.

Question B.003 [1.0]
A small radioactive source is to be stored in the reactor building. The source is estimated to contain 2 curies and emit a 1.33 Mev gamma. Assuming no shielding was to be used, a Radiation Area barrier would have to be erected from the source at a distance of approximately:

a. 6 inches
b. 12 inches
c. 21 inches
d. 57 feet

Answer: B.003 d.
Reference: DR= 6CE/(f)(f) = 0.005 = 6(2)(1.33)/x2, x2 = 3192, x = 56.5 feet

Question B.004 [1.0 point] {4.0}
Safety Limits are …

a. limits on important process variables which are established to protect the integrity of the fuel clad.

b. settings for automatic protective devices related to those variable having significant safety functions.

c. the lowest functional capability or performance levels of equipment required for safe operation of the reactor.

d. settings for ANSI 15.8 suggested reactor scrams and/or alarms which form the protective system for the reactor or provide information which requires manual protective action to be initiated.

Answer: B.004 a.
Reference: Technical Specification Definitions pg. 6

Question B.005 [1.0 point] {5.0}
You are giving a tour to twelve students. The students are divided into three groups of four; each group led by a staff member. How many pocket dosimeters must be issued?

a. Three, one for each group.
b. Twelve, one for each student.
c. None, since they won't get any dose.
d. Fifteen, one for each staff member and student.

Answer: B.005 d.
Reference: RINSC Radiation Safety Guide, pg. 37

Question B.006 [1.0 point] {6.0}
Which one of the following is an Emergency Action Level for an Alert condition at the RINSC?

a. Loss of city water while the reactor is operating.

b. Building air monitor reading 10 times higher than normal.

c. Radiation levels at the site boundary is 75 mrem deep dose equivalent over 24 hours.

d. Radiation levels at the site boundary is 100 mrem/hr for one (1) hour deep dose equivalent.

Answer: B.006 c.
Reference: E-Plan; Emergency Classification System Section 4.0

Question B.007 [1.0 point] {7.0}
Assuming the reactor is operating at 95% power, which one of the following situations does NOT require a reactor scram or shutdown?

a. Reactor power drops unexpectedly to 92%.

b. Reactor power increases to 97% as the pool water temperature increases.

c. Primary flow indication begins to decrease due to a detector failure. (Assume pin hole leak in the dp cell diaphragm.)

d. The alarm for the high neutron flux on one of the compensated ion chamber safety channels becomes inoperable due to a faulty relay.

Answer: B.007 d.
Reference: RINSC Operating Procedures p 8-2

Question B.008 [1.0 point] {8.0}
Who in the organizational chain may authorize an experimenter to insert and remove his own experiments?

a. SRO

b. HP

c. Assistant Director.

d. Reactor Utilization Committee

Answer: B.008 c.
Reference: Operating Procedures 12-1, 12-2

Question B.009 [1.0 point] {9.0}
A sample reading 1 R/hour is placed behind a 2-centimeter lead shield. What will be the resulting exposure rate? Assume no buildup and a linear attenuation equal to 0.52 cm^{-1}.

a. 0.63 R/hr
b. 3.60 R/hr
c. 0.36 R/hr
d. 36 R/hr

Answer: B.009 c.
Reference: $I=Ioe^{-\mu\chi} \rightarrow I=1R/hr\ e(-0.52 \times 2) = 0.36\ R/hr$

Question B.010 [1.0 point] {10.0}
If you had to choose the one resulting in the least dose you would:

a. Take one REM of occupational Gamma exposure.
b. Submerse yourself in AR-41 for 400 occupational DAC-hours.
c. Ingest or inhale 0.02 ALI of a nontoxic radioactive substance.
d. Wear Breathing apparatus while performing “b.” above.

Answer: B.010 c.
Reference: 10CFR20 SUBPART C, APPENDIX B

Question B.011 [1.0 point] {11.0}
Argon-41 is produced by neutron absorption of argon-40. Argon-41 decays by:

a: a 1.3 MeV gamma with a half life of 1.8 hours.
b. a 6.1 MeV gamma with a half-life of 7 seconds.
c. neutron emission with a half-life of 1.8 hours.
d. a 1.3 MeV beta with a half-life of 7 seconds.

Answer: B.011 a.
Reference: NPP Health Physics pg. 5-20

Question B.012 [1.0 point] {12.0}
A point source of gamma radiation measures 50 mr/hr at a distance of 5 ft.
What is the exposure rate (mr/hr) from the source at a distance of 10 ft.

a. 25 mr/hr
b. 12.5 mr/hr
c. 6.25 mr/hr
d. 17.5 mr/hr

Answer: B.012 b.
Reference: $Dr_1D_1^2 = Dr_2D_2^2$ $Dr_2 = Dr_1D_1^2 / D_2^2 = (50 \text{ mr/hr} \times 5 \text{ ft}^2)/10 \text{ ft}^2$
= 12.5 mr/hr

Question B.013 [1.0 point] {13.0}
In accordance with 10 CFR Part 50.54(x), under what conditions can an operator take reasonable action that departs from a license condition or a Technical Specification?

a. In any emergency.

b. In an emergency declared by the Emergency Director.

c. In an emergency, when the action is needed to protect health and safety and no other action is immediately apparent.

d. In an emergency declared by the Emergency Director along with the approval of the Senior Reactor Operator on site.

Answer: B.013 d.
Reference: 10 CFR 50.54 (x)

Question B.014 [1.0 point] {14.0}
The following measurements are made from a beta-gamma point source:
2 R/hr at six inches 0.5 mR/hr at ten feet.
What are the relative fractions of betas and gammas emitted?

a. (1800/200) = 9
b. (2000/200) = 10
c. (1800/20) = 90
d. (2200/200) = 11

Answer: B.014 a.
Reference: Assume beta will not travel 10 feet in air, therefore 0.5 mr is gamma.
Gamma dose at ½ ft is: (DR1)(R12) = (DR2)(R22) → DR2 = (DR1)(R12) / R22 = 0.5 mr x 10 ft2 / 0.5 ft2 = 200 mr/hr
Therefore, beta contribution at ½ ft is 2000 - 200 = 1800 mr/hr.
Beta contribution/Gamma contribution = 1800/200 = 9

Question B.015 [2.0 points, 0.4 each] {16.0}
For each of the conditions listed, identify the appropriate action (Shutdown ℝ {**SD**}, Maintain at Power {**MP**}, Scram {**S}** (manual or automatic).

a. Reactor power increases from 95% to 97% while pool is filling.

b. Reactor power decreases unexpectedly from 95% to 92%.

c. The alarm for the high Neutron flux on one of the safety channels becomes inoperable due to a faulty relay.

d. The temperature of the coolant leaving the core reaches 120□F.

e. Primary flow indication begins to decrease due to a detector failure (assume a pin-hole leak in the Δp cell diaphragm.

Answer: B.015 a. = MP; b. = SD; c. = MP; d. = MP; e. = S
Reference: NRC RI Bank Question

Question B.016 [1.0 point] {17.0}
During a power calibration indicated power differed from calculated power by 15 K watts. Which one of the following actions is required for the Linear Power and Percent Power channels?

a. Adjust the detector high voltage on the detectors.

b. Adjust the compensating voltages on the detectors.

c. Adjust the detector heights.

d. No adjustment necessary.

Answer: B.016 d.
Reference: NRC RI Bank Question

Question B.017 [1.0 point] {18.0}
After receiving your license to maintain it active you must perform the duties of an SRO for a minimum of ___ hours per quarter

a. 2

b. 4

c. 12

d. 24

Answer: B.017 b.
Reference: 10CFR55.

Question B.018 [1.0 point] {19.0}
Which ONE of the following types of experiments may NOT be irradiated within the confines of the pool?

a. explosive materials
b. fueled experiments
c. materials corrosive to reactor components
d. cryogenic liquids

Answer: B.018 a.
Reference: Technical Specification 3.8

Question B.019 [1.0 point] {20}
Which of the following individuals may authorize by his initials implementation of temporary changes to the operational procedures? (select one)

a. Only the Director or the Assistant Director.
b. Any SRO in the absence of the Reactor Facility Director.
c. Only the Reactor Facility Director or the Radiation Protection Officer.
d. The Designated Senior Operator in the absence of the Reactor Facility Director.

Answer: B.019 a.
Reference: Technical Specification Table 3.1

Question C.001 [1.0 point] {1.0}
Which one of the following is the reason why the T.S. limits the pool temperature to less than 130ºF?

a. To provide an acceptable safety margin to the maximum fuel cladding temperature.

b. To provide adequate safety margin in the event of a Loss of Coolant Accident.

c. To provide protection for the cleanup system resin.

d. To prevent film boiling of the reactor coolant.

Answer: C.001 d.
Reference: Technical Specifications 2.1.2 Bases

Question C.002 [1.0 point] {2.0}
What is the reactor pool conductivity limit?

a. ≤ 2 micromho/cm

b. ≤ 4 micromho/cm

c. ≤ 6 micromho/cm

d. ≤ 8 micromho/cm

Answer: C.002 a.
Reference: Technical Specification 3.3.A.2

Question C.003 [1.0 point] {3.0}
A short period scram is initiated when the Log N Period channel senses a period that is .

a. ≤4 seconds

b. ≤5 seconds

c. ≤6 seconds

d. ≤7 seconds.

Answer: C.003 a.
Reference: RINSC Exam Bank Question

Question C.004 [1.0 point] {4.0}
How many plates does a LEU fuel element have?

a. 4
b. 12
c. 18
d. 22

Answer: C.004 d.
Reference: RINSC Exam Bank Question

Question C.005 [1.0 point] {5.0}
Which one of the following describes a condition that will prevent the operator from withdrawing control blades?

a. The startup channel neutron count rate is 8 counts per second.
b. The Power Level Selector switch is in the 5 MW position.
c. The Log N amplifier switch is in the “operate position”.
d. Reactor period is 30 seconds.

Answer: C.005 b.
Reference: SAR (HEU to LEU) pg. 11

Question C.006 [1.0 point] {6.0}
Which of the following safety systems is NOT bypassed when the Power Level Selector Switch is in the 0.1 MW position?

a. The low pool level scram.
b. The bridge low power position scram.
c. The primary coolant low flow rate scram.
d. The primary coolant outlet temperature scram.

Answer: C.006 a.
Reference: Technical Specification Table 3.1

Question C.007 [1.0 point] {7.0}
The reactor is operating with the servo control system maintaining power at 500 kw when compensating voltage is lost to the Linear Level Compensated Ion Chamber. Which one of the following describes the response of the plant to this malfunction?

a. Indicated power will decrease, resulting in the automatic control system dropping out of automatic control.

b. Indicated power will decrease, resulting in the control rod being withdrawn from the core.

c. Indicated power will increase, resulting in the control rod being driven inward.

d. Indicated power will remain constant.

Answer: C.007 c.
Reference: Gladstone & Sesonske, Nuclear Reactor Engineering 3rd Edition, sect. 5.254

Question C.008 [1.0 point] {8.0}
In the forced convection mode and at power levels in excess of 0.1 MW, how many grid positions can be vacant in a fully loaded core?

a. zero.

b. one.

c. two.

d. six.

Answer: C.008 a.
Reference: Technical Specification 3.1 Specifications 9

Question C.009 [1.0 point] {9.0}
Which ONE of the following is the method used to minimize water loss due to a leak in the pneumatic tube system?

a. Manual Ball Valves

b. Automatic Gate Valves.

c. None required, air pressure generated by the blower will prevent water loss.

d. Non required. Due to the low diameter of the piping, the makeup system will easily keep up with the leak.

Answer: C.009 a.
Reference: Draft SAR § 10.2.3.1 last ¶

Question C.010 [1.0 point] {10.0}
Which one of the following does NOT trigger an interlock that prevents the withdrawal of the shim safety blades during start-up?

a. Master switch in “Test”
b. Start up counter in motion
c. Start up counter recorder off
d. Start up counter reading less than 3 cps

Answer: C.010 c.
Reference: RINSC Exam Bank Question

Question C.011 [1.0 point] {11.0}
Which one of the following statements is TRUE?

a. Full flow through the fuel elements will probably not be turbulent at lower temperatures.
b. Inverting an irradiated fuel element would have no effect on core reactivity or differential control rod worth.
c. The RINSC fully reflected reactor will NOT go critical even if the entire 7 x 9 grid of the core were filled with fuel elements.
d. The volume of water transferred from the pool into the primary is controlled primarily by flow paths in the control blade shrouds.

Answer: C.011 b
Reference: SAR

Question C.012 [1.0 point] {12.0}
Which ONE of the following methods is used to determine if there is a leak in the heat exchanger?

a. Routine checks of the secondary coolant for O^{19}.
b. Routine checks of the secondary coolant for Na^{24}.
c. Pool level will decrease due to leakage into the secondary.
d. Decrease in secondary makeup, due to water from primary.

Answer: C.012 b.
Reference: Tech Specs

Question C.013 [1.0 point] {13.0}
Which one of the following fans will come on or remain on upon activation of a confinement signal?

a. The Off-Gas Blower
b. The Dilution air Blower
c. The Pneumatic System Blower
d. The Normal Ventilation Exhaust Fan

Answer: C.013 b.
Reference: Draft SAR

Question C.014 [1.0 point] {14.0}
Which ONE of the following is the method used to reduce Ar^{41} dose from the pneumatic tube system?

a. Blower exhausts through a HEPA filter and eventually into the stack.
b. A Nitrogen purge is maintained on the system.
c. A CO_2 purge is maintained on the system
d. Lead shielding on the receiver station.

Answer: C.014 a.
Reference: Draft SAR, § 10.3.1

Question C.015 [1.0 point] {15.0}
The Delay Tank is vented

a. into the suction line of the reactor room exhaust blower.
b. into the suction of the dilution air blower.
c. into the suction of the off-gas blower.
d. directly to the base of the stack.

Answer: C.015 a
Reference: SAR System Description

Question C.016 [1.0 point] {16.0}
WHICH ONE of the following poisons is used in the four control blades?

a. Borated Graphite
b. Boron-Carbide
c. Hafnium
d. Stainless Steel.

Answer: C.016 b.
Reference: Draft SAR § 4.2.2, 1st ¶.

Question C.017 [1.0 point] {17.0}
Which ONE of the following is the actual design feature which prevents siphoning of pool water on a failure of the primary system?

a. All primary system pipes end three feet below the water surface.
b. The suction and return line each contain a siphon break valve and stand-pipe.
c. The suction and return line each contain a valve which will inject service air into the loop.
d. The suction and discharge lines both contain anti-siphon loops, which go to above the water level then out through the pool wall.

Answer: C.017 d.
Reference: SAR § 4.2.2 Primary Coolant System, 5th ¶.

Question C.018 [1.0 point] {18.0}
Which ONE of the following is the main function performed by the DISCRIMINATOR circuit in the Startup Channel?

a. To generate a current signal equal and of opposite polarity as the signal due to gammas generated within the Startup Channel Detector.
b. To filter out small pulses due to gamma interactions, passing only pulses due to neutron events within the Startup Channel Detector.
c. To convert the logarithmic output of the metering circuit to a δt (delta time) output for period metering purposes.
d. To convert the linear output of the Startup Channel Detector to a logarithmic signal for metering purposes.

Answer: C.018 b.
Reference: Standard NRC question.

Question C.019 [1.0 point] {19.0}
Which ONE of the following is the Blade Withdrawal Interlock?

a. Source Range Signal/noise ratio of 2
b. Low source count rate < 3 cps
c. Period - 45 seconds
d. High flux - 105%

Answer: C.019 b.
Reference: Technical Specifications Table 3.2.

Question C.020 [1.0 point] {20.0}
WHICH ONE of the following detectors is used primarily to measure N^{16} release to the environment?

a. NONE, N^{16} has too short a half-life to require environmental monitoring.
b. Stack Particulate Monitor
c. Stack Gas Monitor
d. Bridge Area Monitor

Answer: C.020 a.
Reference: Standard NRC Question.