February 3, 2015

Peter F. Caracappa, Ph.D, CHP
Department of Mechanical, Aerospace and Nuclear Engineering,
Building JEC- Room 2032,
Rensselaer Polytechnic Institute
110 8th Street
Troy, NY 12180-3590

SUBJECT: EXAMINATION REPORT NO. 50-225/OL-15-01, RENSSELAER POLYTECHNIC INSTITUTE

Dear Dr. Caracappa:

During the week of January 12, 2015, the NRC administered operator licensing examinations at Rensselaer Polytechnic Institute 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 e-mail at phillip.young@nrc.gov.

Sincerely,

Kevin Hsueh, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-225

Enclosures:
1. Examination Report No. 50-225/OL-15-01
2. Written examination with comments

cc w/o enclosures: See next page

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/RAPatrick Isaac acting for/
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OFFICE	NRR/DPR/PROB	NRR/DPR/PROB	NRR/DPR/PROB
NAME	PYoung	CRevelle	KHsueh PIsaac for
DATE	01/27/2015	01/29/2015	02/03/2015

OFFICIAL RECORD COPY

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

REPORT NO.: 50-225/OL-15-01

FACILITY DOCKET NO.: 50-225

FACILITY LICENSE NO.: CX-22

FACILITY: Rensselaer Polytechnic Institute

EXAMINATION DATES: January 13, 2015

SUBMITTED BY:

/RA Patrick Isaac acting for/ ***02/03/2015***
Phillip T. Young, Chief Examiner DATE

SUMMARY:

During the week of January 13, 2015 the NRC administered licensing examinations to two Senior Operator Instant (SROI) applicants. The applicants passed all portions of the 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	2/0	2/0
Operating Tests	0/0	2/0	2/0
Overall	0/0	2/0	2/0

3. Exit Meeting:
Phillip T. Young, U.S. NRC
Glenn Winters, RPI, Reactor Supervisor

The examiner thanked the facility for their assistance ensuring the examination administration went smoothly and their feedback on the written examination.

FACILITY COMMENTS:

Dear Mr. Young,

I had time to more closely review the written exam, and, perhaps, be more critical toward the questions. Some could have been better worded, or made more applicable to our facility.

COMMENT: Question A.10:
As a reactor continues to operate over time, for a constant power level, the average neutron flux:
A) decreases, due to the increase in fission product poisons
B) decreases, because fuel is being depleted
C) increases, in order to compensate for fuel depletion
D) remains the same
At the RCF, the low power does not create enough burn-up to deplete fuel and the neutron flux remains constant. For our facility, then, D would be correct. A reactor which depletes fuel would respond differently.

NRC Resolution:
Since the question is not applicable to the operation of the RCF reactor, the question is deleted from the examination and grading adjusted accordingly.

COMMENT: Question A.11:
The neutron microscopic cross section for absorption, sigma_a, generally:
A) increases as neutron energy increases
B) decreases as neutron energy increases
C) increases as the mass of the target nucleus increases
D) decreases as the mass of the target nuclear increases
Depends on the energy range in question. Epithermal resonances cause both increases and decreases of absorption cross-section. True, the thermal energy region sees a decrease with increased energy, but the question didn't limit energy to just thermal values. Considering resonances, the question has no completely correct answer.

NRC Resolution:
The question states "generally" and the reference is correct, comment not accepted.

COMMENT: Question A.12:
A reactor is operating at criticality. Instantaneously, all of the delayed neutrons are suddenly removed from the reactor. The K_eff of the reactor in this state would be approximately:
A) 1.007
B) 1.000
C) 0.993
D) 0.000

FACILITY COMMENTS: (continued)

If I define Keff as production/(absorption + leakage) [coincidently, the next question], the correct answer is B since the question only removes the existing delayed neutrons, and does not change the production of additional delayed neutrons. If the delayed neutron precursors, or the production rate were removed, then C is correct. I realize the question was intended to determine the magnitude of the delayed neutron fraction, but the awkward scenario makes this an easy question to overthink, leading to potentially two correct answers.

NRC Resolution:
The point of the question is to test the applicant on the value of the beta fraction, the answer as stated is correct. The comment is not accepted.

U. S. NUCLEAR REGULATORY COMMISSION
NON-POWER INITIAL REACTOR LICENSE EXAMINATION

FACILITY: RPI
REACTOR TYPE: Critical Experimental
DATE ADMINISTERED: 01/13/2015
CANDIDATE: _____

INSTRUCTIONS TO CANDIDATE:
Answers are to be written on the answer sheet provided. Attach the answer sheets to the examination. Points for each question are indicated in parentheses for each question. A 70% in each section is required to pass the examination. Examinations will be picked up three (3) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
15.00	33.3	_____	____	A. REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS
16.00	33.3	_____	____	B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
16.00	33.3	_____	____	C. FACILITY AND RADIATION MONITORING SYSTEMS
48.00		_____	____%	TOTALS
		FINAL GRADE		

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

_____
Candidate's Signature

Enclosure 2

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

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

2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have neither received nor given assistance in completing the examination. This must be done after you complete the examination.

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

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

5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet and each answer sheet.

6. Mark your answers on the answer sheet provided. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.

7. The point value for each question is indicated in [brackets] after the question.

8. If the intent of a question is unclear, ask questions of the examiner only.

9. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition turn in all scrap paper.

10. Ensure all information you wish to have evaluated as part of your answer is on your answer sheet. Scrap paper will be disposed of immediately following the examination.

11. To pass the examination you must achieve a grade of 70 percent or greater in each category.

12. There is a time limit of three (3) hours for completion of the examination.

EQUATION SHEET

$Q = m\ c_p\ \Delta T$

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

$SUR = 26.06/\tau$

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

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

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

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

$DR_1D_1^2 = DR_2D_2^2$

$DR = DR_oe^{-\lambda t}$

$DR = 6CiE/D^2$

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

1 eV = $1.6x10^{-19}$ watt-sec.

1 gallon water = 8.34 pounds

1 Btu = 778 ft-lbf

□F = 9/5□ C + 32

1 Mw = $3.41x10^6$ BTU/hr

□C = 5/9 (□F - 32)

DR – Rem, Ci – curies, E – Mev, R – feet

1 Curie = 3.7×10^{10} dis/sec

1 kg = 2.21 lbm

1 Horsepower = 2.54×10^3 BTU/hr

1 Mw = 3.41×10^6 BTU/hr

1 BTU = 778 ft-lbf

ºF = 9/5 ºC + 32

1 gal (H_2O) ≈ 8 lbm

ºC = 5/9 (ºF - 32)

c_P = 1.0 BTU/hr/lbm/ºF

c_p = 1 cal/sec/gm/ºC

Question A.001 (1.0 point) {1.0}
A reactor fuel consisting of only U-235 and U-238 is 20% enriched. This means that:

a. 20% of the volume of the fuel consists of U-235.

b. 20% of the weight of the fuel consists of U-235.

c. the ratio of the number of U-235 atoms to the number of U-238 atoms is 0.20 (20%).

d. 20% of the total number of atoms in the fuel consists of U-235.

Answer: A.01 b.
Reference: Lamarsh, Introduction to Nuclear Engineering, 2nd Edition, page 112.

Question A.002 (1.0 point) {2.0}
The term "Prompt Critical" refers to:

a. the instantaneous jump in power due to a rod withdrawal

b. a reactor which is critical using only prompt neutrons

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

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

Answer: A.02 b.
Reference: Lamarsh, Introduction to Nuclear Engineering, 3rd Edition, Section 7.2, page 340.

Question A.003 (1.0 point) {3.0}
With the reactor critical at 10 watts, a rod withdrawal results in a power increase with a doubling time of 40 seconds. Reactor power two minutes later is:

a. 30 watts

b. 60 watts

c. 80 watts

d. 90 watts

Answer: A.03 c.
Reference: Laboratory 3 Experiment. Period = (Doubling Time)/0.693 = 57.7 sec.
$P = P_o e^{120/57.7} = 10e^{2.08} = 80$ watts

Question A.004 (1.0 point) {4.0}
A thermal neutron is a neutron which:

a. is produced as a result of thermal fission.

b. has been produced several seconds after its initiating fission occurred.

c. possesses thermal rather than kinetic energy.

d. experiences no net change in its energy after several collisions with atoms of the diffusing medium.

Answer: A.04 d.
Reference: Laboratory 5 Experiment

Question A.005 (1.0 point) {5.0}
The factor in the six-factor formula which is most affected by control rod position is:

a. Resonance escape probability

b. Fast fission factor

c. Neutron reproduction factor

d. Thermal utilization factor

Answer: A.05 d.
Reference: Lamarsh, Introduction to Nuclear Engineering, 3rd Ed, Section 6.1, page 269.

Question A.006 (1.0 point) {6.0}
Which ONE statement below describes a positive moderator temperature coefficient?

a. When moderator temperature increases, positive reactivity is added.

b. When moderator temperature decreases, positive reactivity is added.

c. When moderator temperature increases, negative reactivity is added.

d. When moderator temperature increases, reactor power decreases.

Answer: A.06 a.
Reference: Laboratory 6 Experiment.

Question A.007 (1.0 point) {7.0}
Core excess reactivity changes with…

a. Fuel burnup

b. Control Rod Height

c. Neutron Level

d. Reactor Power Level

Answer: A.07 a.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 6.2 p. 6-1 — 6-4.

Question A.008 (1.0 point) {8.0}
Which condition below describes a reactor which is exactly critical.

a. k = 1; delta k/k = 1

b. k = 1; delta k/k = 0

c. k = 0; delta k/k = 1

d. k = 0; delta k/k = 0

Answer: A.08 b.
Reference: Standard NRC Question

Question A.009 (1.0 point) {9.0}
As a result of beta decay:

a. The atomic mass number decreases by 1, and the number of protons remains constant.

b. The atomic mass number remains constant, and the number of protons increases by 1.

c. The atomic mass number decreases by 1, and the number of protons decreases by 1.

d. The atomic mass number remains constant, and the number of protons remains constant

Answer: A.09 b.
Reference: Lamarsh, Introduction to Nuclear Engineering, 2nd Edition, page 71.

Question A.010 (1.0 point) {10.0} DELETED

~~As a reactor continues to operate over time, for a constant power level, the average neutron flux:~~

~~a. decreases, due to the increase in fission product poisons.~~

~~b. decreases, because fuel is being depleted.~~

~~c. increases, in order to compensate for fuel depletion.~~

~~d. remains the same.~~

~~Answer: A.10 c.~~
~~Reference: Burn, Introduction to Nuclear Reactor Operations, page 2-50.~~

Question A.011 (1.0 point) {11.0}

The neutron microscopic cross section for absorption, σ_a , generally:

a. increases as neutron energy increases.

b. decreases as neutron energy increases.

c. increases as the mass of the target nucleus increases.

d. decreases as the mass of the target nucleus increases.

Answer: A.11 b.
Reference: Burn, Introduction to Nuclear Reactor Operations, page 2-36.

Question A.012 (1.0 point) {12.0}

A reactor is operating at criticality. Instantaneously, all of the delayed neutrons are suddenly removed from the reactor. The K_{eff} of the reactor in this state would be approximately:

a. 1.007

b. 1.000

c. 0.993

d. 0.000

Answer: A.12 c.
Reference: DOE Fundamentals Handbook, Module 2, page 30.

Question A.013 (1.0 point) {13.0}
The effective neutron multiplication factor, K_{eff}, is defined as:

a. absorption/(production + leakage)

b. (production + leakage)/absorption

c. (absorption + leakage)/production

d. production/(absorption + leakage)

Answer: A.13 d.
Reference: Lamarsh, Introduction to Nuclear Engineering, 2nd Edition, page 195.

Question A.014 (1.0 point) {14.0}
Which ONE of the following statements describes the difference between Differential (DRW) and Integral (IRW) rod worth curves?

a. DRW relates the worth of the rod per increment of movement to rod position. IRW relates the total reactivity added by the rod to the rod position.

b. DRW relates the time rate of reactivity change to rod position. IRW relates the total reactivity in the core to the time rate of reactivity change.

c. IRW relates the worth of the rod per increment of movement to rod position. DRW relates the total reactivity added by the rod to the rod position.

d. IRW is the slope of the DRW at a given rod position

Answer: A.14 a.
Reference: Laboratory 4 Experiment.

Question A.015 (1.0 point) {15.0}
Which ONE of the following isotopes has the largest microscopic cross-section for absorption for thermal neutrons?

a. Sm^{149}

b. U^{235}

c. Xe^{135}

d. B^{10}

Answer: A.15 c.

Reference: Lamarsh, J. "Introduction to Nuclear Engineering" p. 738 Sm^{149} (41,000 b); U^{235} (687 b); Xe^{135} (2.65×10^6 b); B^{10} (3840 b)

Question A.016 (1.0 point) {16.0}
If β_{eff} =0.00765, then what would the reactivity be in **Δk/k** if **$1.75** were added to a reactor core?

a. 0.0019 Δk/k

b. 0.0134 Δk/k

c. 1.0134 Δk/k

d. 1.737 Δk/k

Answer: A.16 b
Reference: NEEP 234 "Reactor Physics II" pg. 2

(*** End of Section A ***)

Question B.001 (1.0 point) {1.0}
Which ONE of the following describes the Technical Specifications limits pertaining to control rod operability?

a. All four control rods must be operable for reactor operation.

b. One control rod may be inoperable provided it is fully inserted.

c. One control rod may be inoperable provided a $0.9 shutdown margin is maintained with the inoperable rod withdrawn.

d. Two control rods may be inoperable provided they are not adjacent AND the moderator dump scram is operable.

Answer: B.01 a.
Reference: Technical Specifications, Section 3.2.

Question B.002 (1.0 point) {2.0}
"The excess reactivity of the reactor core above cold, clean critical shall not be greater than $0.60." This is an example of a(n):

a. safety limit.

b. limiting safety system setting.

c. limiting condition for operation.

d. surveillance requirement.

Answer: B.02 c.
Reference: Technical Specifications, Section 3.1.

Question B.003 (1.0 point) {3.0}
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, when the action is needed to protect health and safety and no other action is immediately apparent.

c. In an emergency declared by the Emergency Director.

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

Answer: B.03 b.
Reference: 10CFR50.54 (x)

Question B.004 (1.0 point) {4.0}
In accordance with Technical Specifications, a REACTOR SHUTDOWN condition requires all control rods are fully inserted and:

a. the console key is removed.
b. the reactor is shutdown by at least $1.00.

c. no operations are in progress which involve control rod maintenance.

d. no operations are in progress which involve moving fuel pins in the reactor vessel.

Answer: B.04 b.
Reference: Technical Specifications, Definitions.

Question B.005 (1.0 point) {5.0}
The reactor parameter which is protected by Safety Limits is:

a. steady state power level.

b. fuel pellet temperature.

c. moderator level.

d. fuel clad temperature.

Answer: B.05 b.
Reference: Technical Specifications, 2.1.

Question B.006 (1.0 point) {6.0}
The gamma radiation level from a point source is 10 R/hour at a distance of 1 foot from the source. The radiation level 8 feet from the source is approximately:

a. 19 mR/hour

b. 156 mR/hour

c. 625 mR/hour

d. 1250 mR/hour

Answer: B.06 b.
Reference: $DR_1D_1^2 = DR_2D_2^2(10)(1) = DR_2(64)$; $DR_2 = 10/64 = 0.156$ R/hr = 156 mR/hr.

Question B.007 (1.0 point) {7.0}
If smoke or fire is detected, the operator must immediately:

a. stop all rod withdrawal and notify the Senior Reactor Operator.

b. determine the location, and close down all fans.

c. notify the Operations Supervisor.

d. shutdown and secure the reactor.

Answer: B.07 d.
Reference: RPI Emergency Procedures, Section 6.2.

Question B.008 (1.0 point) {8.0}
Which ONE of the following Non-Radiological Emergencies does NOT require that the reactor be shut down and secured?

a. Act of civil disorder.

b. Smoke or fire.

c. Human injury.

d. Bomb threat.

Answer: B.08 c.
Reference: RPI Emergency Procedures, Section 6.6.

Question B.009 (1.0 point) {9.0}
Two point sources have the same curie strength. Source A's gammas have an energy of 1 Mev, whereas Source B's gammas have an energy of 2 Mev. You obtain a reading from the same GM tube 10 feet from each source. Concerning the two readings, which ONE of the following statements is correct?

a. The reading from Source B is four times that of Source A.

b. The reading from Source B is twice that of Source A.

c. Both readings are the same.

d. The reading from Source B is half that of Source A.

Answer: B.09 c.
Reference: GM tube cannot distinguish between energies.

Question B.010 (1.0 point) {10.0}
The dose rate from a mixed beta-gamma source is 100 mr/hour at a distance of one (1) foot, and is 0.1 mr/hour at a distance of twenty (20) feet. What percentage of the source consists of beta radiation?

a. 20%

b. 40%

c. 60%

d. 80%

Answer: B.10 c.
Reference: At 20 feet, there is no beta radiation. Gamma at 20 feet = 0.1 mr/hour, gamma at 1 foot = 40 mr/hour. Therefore beta at 1 foot = 60 mr/hour = 60%.

Question B.011 (1.0 point) {11.0}
In accordance with the Power Calibration Procedure, if the absolute power level of the log power chamber does not agree within 10% of the log power recorder:

a. The log power recorder scale must be recalibrated.

b. The position of the chamber must be adjusted to give the proper indication.

c. The high voltage to the chamber must be adjusted to give the proper indication.

d. The compensating voltage of the chamber must be adjusted to give the proper indication.

Answer: B.11 a.
Reference: Surveillance Procedures, “Power Calibration”.

Question B.012 (1.0 point) {12.0}
Two Emergency classes for the Critical Facility are:

a. Protective Action Guide and Emergency Action Level.

b. Personnel Emergency and Protective Action Guide.

c. Emergency Action Level and Emergency Alert.

d. Personnel Emergency and Emergency Alert.

Answer: B.12 d.
Reference: Emergency Plan, Section 4.

Question B.013 (1.0 point) {13.0}
"Area for which offsite emergency planning is performed to assure that prompt and effective actions can be taken to protect the public in the event of an accident" defines a (an):

a. site boundary
b. operations boundary
c. emergency support center
d. emergency planning zone

Answer: B.13 d.
Reference: Emergency Plan, Definitions.

Question B.014 (1.0 point) {14.0}
A KNOWN CORE is one for which:

a. the core has been critical and the critical bank position has been measured.

b. fuel movement may occur with only three control rods and rod drives operational.

c. the inverse multiplication method is used for fuel addition in the initial approach to criticality.

d. the addition, movement or removal of fuel is limited to $0.30 of reactivity or four fuel pins,whichever is smaller.

Answer: B.14 a.
Reference: Operating Procedures, G, Fuel Handling.

Question B.015 (1.0 point) {15.0}
Prior to the disposal of water from the reactor tank, storage tank or sump, it must be tested to ensure:

a. the activity is within limits

b. the pH is between 4.7 and 7.0

c. the temperature is less than 70 deg. F

d. the particulate concentration is within limits

Answer: B.15 a.
Reference: Operating Procedures, I, Water Disposal.

Question B.016 (1.0 point) {1.0}
The following is an example of a portable __?

a. Neutron detector

b. Alpha detector

c. Geiger-Mueller detector

d. Air sampler

Answer: B.16 a
Reference: http://www.deqtech.com/Ludlum_Medical_Physics/Products/m2241-4.htm

(*** End of Section B ***)

Section C: Facility and Radiation Monitoring Systems

Question C.001 (1.0 point) {1.0}
Which ONE of the following will result in a control rod withdrawal interlock (i.e., rod remains as is)?

a. Neutron flux < 2 cps

b. Failure of the power supply

c. Reactor period > 20 seconds

d. Water level in tank > 11 inches above top grid

Answer: C.01 a.
Reference: Technical Specifications, 3.2 - Reactor Control and Safety Systems

Question C.002 (1.0 point) {2.0}
If control rod sensitivity is known, withdrawal of the rods as a bank is permitted as long as:

a. reactor period is greater than 20 seconds

b. the reactivity addition does not exceed $0.05 per second

c. the reactivity addition does not exceed $0.20 per second

d. the source level channel has increased by less than one decade

Answer: C.02 b.
Reference: Operating Procedures, Section A.

Question C.003 (1.0 point) {3.0}
The reactor will scram if one of the following interlocks is not satisfied:

a. Reactor Period > 15 sec

b. Reactor Console keys(2) on

c. Line voltage to records > 110V

d. Moderator-Reflector water fill ‘off’

Answer: C.03 b.
Reference: Technical Specification (3.2) Table 2 (interlock)

Question C.004 (1.0 point) {4.0}
Which of the following is the RPI RCF TS temperature minimum limit for the reactor tank water?

a. 40°F

b. 50°F

c. 80°F

d. 100°F

Answer: C.04 b.
Reference: Technical Specifications 3.1 - Reactor Core Parameters

Question C.005 (1.0 point) {5.0}
You are conducting a reactor startup and begin to pull rods. When doing so you observe that there is no outward rod motion. Which of the following is most likely the cause for the inability to move rods outward?

a. Reactor water tank temperature is below the minimum setpoint value

b. Startup Channel A count rate reads 1 cps

c. Reactor period is 20 seconds

d. Reactor water fill pump is on

Answer: C.05 d.
Reference: RPI SAR, Figure 7.2, November 2002 & June 2011

Question C.006 (1.0 point) {6.0}
Which of the following would you most likely find in the control rod “baskets”?

a. Lead cement which supports the absorber section

b. A reflector section made of graphite

c. An absorber section made of boron

d. An aluminum oxide (Al_2O_3) insulator

Answer: C.06 c.
Reference: RPI SAR, Section 4.2.1, November 2002 & June 2011

Question C.007 (1.0 point) {7.0}
By RPI RCF TS, which of the following is considered the “auxiliary reactor scram”?

a. Turning the reactor key to the “off” position

b. Intentionally opening the reactor door

c. The moderator-reflector water dump

d. Opening the breaker which disconnects the electrical power of the facility from the reactor

Answer: C.07 c.
Reference: Technical Specifications, 3.2 - Reactor Control and Safety Systems

Question C.008 (1.0 point) {8.0}
What is the maximum fill capacity of the reactor water tank?

a. >70 inches

b. ≤68 inches

c. <50 inches

d. <19.5 inches

Answer: C.08 b.
Reference: RPI RCF Operating Procedures Section 8.1

Question C.009 (1.0 point) {9.0}
What is the setpoint for the control room radiation monitor alarm?

a. 5 mr/hr

b. 10 mr/hr

c. 40 mr/hr

d. 100 mr/hr

Answer: C.09 b.
Reference: RPI RCF Operating Procedures Section 8.1

Question C.010 (1.0 point) {10.0}
The SPERT fuel elements consist of:

a. 4.8% enriched uranium with stainless steel clad.

b. 35.2% enriched uranium with stainless steel clad.

c. 8% enriched uranium with aluminum clad.

d. 35.2% enriched uranium with aluminum clad.

Answer: C.10 a.
Reference: SAR, 4.2.1 Reactor Fuel

Question C.011 (1.0 point) {11.0}
At the RPI CRF when the reactor is in the Standard configuration, you would expect _fuel pins in an octagonal array.

a. 332

b. 327

c. 323

d. 319

Answer: C.11 a.
Reference: RPI SAR, Section 4. Reactor Description, November 2002 & June 2011

Question C.012 (1.0 point) {12.0}
When there is a loss of power, the reactor tank pump:

a. suction valve fails OPEN, and the discharge valve fails CLOSED.

b. suction valve fails OPEN, and the discharge valve fails OPEN.

c. suction valve fails CLOSED, and the discharge valve fails CLOSED.

d. suction valve fails CLOSED, while the discharge valve fails OPEN.

Answer: C.12 a.
Reference: SAR Figure 5.1.

Question C.013 (1.0 point) {13.0}
The area gamma monitoring system has detectors located in the control room, in the reactor room:

a. on the reactor deck and outside the reactor room window.

b. in the counting room and outside the reactor room window.

c. on the reactor deck and in the fuel storage vault.

d. in the counting room and in the fuel storage vault.

Answer: C.13 a.
Reference: SAR 7.7 Radiation Monitoring System

Question C.014 (1.0 point) {14.0}
The structure within the core that forms the base of the three-tiered core-support structure is the:

a. carrier plate.

b. plastic spacer plate.

c. fuel pin lattice plate.

d. unistrut support plate.

Answer: C.14 a.
Reference: SAR - Figure 4.12: Core Support Structure

Question C.015 (1.0 point) {15.0}
The reactor room ventilation system:

a. shares a vent with the control room ventilation system

b. exhaust fan starts up in response to high radiation alarms

c. exhaust vent closes in response to high radiation alarms

d. operates by natural circulation, with its own vent to the outside stack

Answer: C.15 d.
Reference: SAR page 9-1

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Question C.016 (1.0 point) {16.0}
A linear power channel (LP1 or LP2) uses a (an):

a. fission chamber

b. boron-trifluoride detector

c. compensated ion chamber

d. uncompensated ion chamber

Answer: C.16 d.
Reference: SAR - 7.2 Design of Instrumentation and Control Systems

(*** End of Examination ***)