August 15, 2005

Dr. William Vernetson, Facility Director
University of Florida
202 Nuclear Science Center
P.O. Box 118300
Gainesville, FL 32611-8300

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-083/OL-05-01, UNIVERSITY OF FLORIDA

Dear Dr. Vernetson:

During the week of August 1, 2005, the NRC administered initial examinations to employees of your facility who had applied for a license to operate your University of Florida reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. At the conclusion of the examination, the examination questions and preliminary findings were discussed with those members of your staff identified in the enclosed report.

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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) 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. Warren Eresian at 301-415-1833 or internet e-mail wje@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. 50-083

Enclosures: 1. Initial Examination Report No. 50-083/OL-05-01
2. Examination and answer key

cc w/encls: Please see next page

cc:

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DISTRIBUTION:

PUBLIC	RNRP\R&TR r/f	Facility File (EBarnhill)
MMendonca, PM	WEresian	PMadden

EXAMINATION PACKAGE ACCESSION NO.: ML051570128
EXAMINATION REPORT ACCESSION NO.: ML052200048 **TEMPLATE No.: NRR-074**

OFFICE	RNRP:CE		IROB:LA		RNRP:SC	
NAME	WEresian		EBarnhill		PMadden	
DATE	08/ 9 /2005		08/ 11 /2005		08/ 12 /2005	

C = COVER **E = COVER & ENCLOSURE** **N = NO COPY**
OFFICIAL RECORD COPY

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

REPORT NO.:	50-083/OL-05-01
FACILITY DOCKET NO.:	50-083
FACILITY LICENSE NO.:	R-56
FACILITY:	University of Florida
EXAMINATION DATES:	August 1-2, 2005
EXAMINERS:	Warren Eresian, Chief Examiner
SUBMITTED BY:	**/RA/** 08/ 9 /2005 Warren Eresian, Chief Examiner Date

SUMMARY:

During the week of August 1, 2005, the NRC administered an operator licensing examination to one Reactor Operator candidate. The candidate passed the examination.

ENCLOSURE 1

REPORT DETAILS

1. Examiners: Warren Eresian, Chief Examiner

2. Results:

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

3. Exit Meeting:

Warren Eresian, NRC Chief Examiner
William Vernetson, Facility Director

The NRC thanked the facility staff for their cooperation during the examination. No generic concerns were noted. The facility reviewed the written examination and provided no comments.

U. S. NUCLEAR REGULATORY COMMISSION
RESEARCH REACTOR LICENSE EXAMINATION

FACILITY: University of Florida

REACTOR TYPE: ARGONAUT

DATE ADMINISTERED: 08/01/2005

REGION: 1

CANDIDATE:_____

INSTRUCTIONS TO CANDIDATE:

Answers are to be written on the answer sheets provided. Attach all answer sheets to the examination. Points for each question are indicated in parentheses for each question. A score of 70 percent in each category is required to pass the examination.

Examinations will be picked up 3 hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE		CATEGORY
20	35	_____	_____	A.	REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS
16	30	_____	_____	B.	NORMAL/ EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS
20	35	_____	_____	C.	FACILITY AND RADIATION MONITORING SYSTEMS
56	100	_____	_____		
			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 not received or 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.

6. Print your name in the upper right-hand corner of the answer sheets.

7. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK. NOTE: partial credit will NOT be given on multiple choice questions.

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. When you are done and have turned in your examination, leave the examination area as defined by the examiner. If you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION: 001 (1.00)

In a subcritical reactor, K_{eff} is increased from 0.861 to 0.946. Which ONE of the following is the amount of reactivity that was added to the reactor core?

a. 0.085 delta k/k

b. 0.104 delta k/k

c. 0.161 delta k/k

d. 0.218 delta k/k

QUESTION: 002 (1.00)

Which ONE of the following describes the difference between reflectors and moderators?

a. Reflectors decrease core leakage while moderators thermalize neutrons

b. Reflectors shield against neutrons while moderators decrease core leakage

c. Reflectors decrease thermal leakage while moderators decrease fast leakage

d. Reflectors thermalize neutrons while moderators decrease core leakage

QUESTION: 003 (1.00)

A reactor is operating at a steady-state power level of 1.000 MW. Reactor power is increased to a new steady-state power level of 1.004 MW. At the higher level, K_{eff} is:

a. 1.004

b. 1.000

c. 0.004

d. 0.000

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

QUESTION: 004 (1.00)

Which ONE of the following is NOT true regarding neutron cross sections?

a. Nuclear cross section is the sum of the neutron scattering and absorption cross sections for a specific material.

b. Microscopic cross section is the area of neutron interaction for a wall of material one atom thick.

c. Macroscopic cross section is the product of the microscopic cross section and the number of nuclei per unit volume.

d. Nuclear cross section is the sum of the microscopic and macroscopic cross sections for a specific material.

QUESTION: 005 (1.00)

Which ONE of the answers below is correct to complete the following statement?

The majority of the energy from the fission event is transferred into heat by:

a. the transfer of kinetic energy from the fission fragments.

b. the transfer of kinetic energy from fission neutrons to the hydrogen in the reactor coolant.

c. the absorption of gamma rays from the interaction with reactor components.

d. the deceleration and absorption of beta particles from the interaction with reactor components.

QUESTION: 006 (1.00)

Which ONE of the following is NOT true regarding delayed neutrons?

a. Delayed neutrons comprise less than one percent of the total neutrons.

b. Delayed neutrons are produced from unstable nuclides or fission products.

c. Delayed neutrons are produced at the same energy as prompt neutrons.

d. Delayed neutrons are more likely to cause fission than prompt neutrons.

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

QUESTION: 007 (1.00)

When a reactor is scrammed, the xenon population starts to increase. This occurs primarily because:

a. delayed neutrons are continuing to be produced and cause fissions, resulting in xenon production.

b. the half-life for the decay of I-135 is shorter than the half-life for the decay of Xe-135.

c. Xe-135 is stable and does not decay.

d. the neutron population is so low that xenon burnout does not occur.

QUESTION: 008 (1.00)

Reactor power has increased in 305 seconds from 50 watts to 75 KW on a stable reactor period. Which ONE of the following was the stable reactor period of the power change?

a. 0.24 seconds.

b. 42 seconds.

c. 61 seconds.

d. 752 seconds.

QUESTION: 009 (1.00)

Which ONE of the following describes the purposes of the neutron source for a reactor?

a. To provide delayed neutrons to ensure reactor control, and to provide a steady source of neutrons to increase count rate.

b. To provide neutrons during reactor start-up, and to provide an initial neutron flux field to which the neutron detectors are sensitive.

c. To provide neutrons for reactor startup, and to decrease the amount of time it takes for subcritical multiplication to level off during reactor startup.

d. To provide an initial neutron flux field to which the neutron detectors are sensitive, and to absorb neutrons at high power densities.

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

QUESTION: 010 (1.00)

Which ONE of the following elements will slow down fast neutrons most quickly, i.e. produces the greatest energy loss per collision?

a. Oxygen-16

b. Uranium-238

c. Hydrogen-1

d. Boron-10

QUESTION: 011 (1.00)

A reactor is critical at 50% of rated power, with reactivity = zero. A control rod is withdrawn and the power increases to a higher steady-state value. The reactivity of the reactor at the higher power level is zero because:

a. the positive reactivity due to the fuel temperature decrease balances the negative reactivity due to the control rod withdrawal.

b. the negative reactivity due to the fuel temperature decrease equals the positive reactivity due to the control rod withdrawal.

c. the positive reactivity due to the fuel temperature increase balances the negative reactivity due to the control rod withdrawal.

d. the negative reactivity due to the fuel temperature increase equals the positive reactivity due to the control rod withdrawal.

QUESTION: 012 (1.00)

A reactor with an initial population of 240,000 neutrons is operating with K_{eff} = 1.001. Considering only the increase in neutron population, how many neutrons (of the increase) will be prompt when the neutron population changes from the current generation to the next? Assume β = 0.007.

a. 24

b. 238

c. 2,400

d. 240,240

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

QUESTION: 013 (1.00)

During the neutron cycle from one generation to the next, several processes occur that may increase or decrease the available number of neutrons. Which ONE of the following factor 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.

QUESTION: 014 (1.00)

Which ONE of the following is the reason for operating with thermal neutrons rather than fast neutrons?

a. Probability of fission is increased since thermal neutrons are less likely to leak out of the core.

b. As neutron energy increases, neutron absorption in non-fuel materials increases exponentially.

c. The absorption cross-section of U-235 is much higher for thermal neutrons.

d. The fuel temperature coefficient becomes positive as neutron energy increases.

QUESTION: 015 (1.00)

A reactor is slightly supercritical with the following values for each of the factors in the six-factor formula:

Fast fission factor =	1.03
Fast non-leakage probability =	0.84
Resonance escape probability =	0.96
Thermal non-leakage probability =	0.88
Thermal utilization factor =	0.70
Reproduction factor =	1.96

A control is inserted to bring the reactor back to critical. Assuming all other factors remain unchanged, the new value for the thermal utilization factor is:

a. 0.698

b. 0.702

c. 0.704

d. 0.708

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

QUESTION: 016 (1.00)

Which ONE of the following parameter changes will require control rod INSERTION to maintain constant power level following the change?

a. Coolant water temperature increase.

b. Insertion of a void into the core.

c. Removal of an experiment containing cadmium.

d. Buildup of samarium in the core.

QUESTION: 017 (1.00)

Which ONE of the following is the time period during which the MAXIMUM amount of Xenon-135 will be present in the core?

a. 10 to 12 hours after a startup to 100% power.

b. 4 to 6 hours after a power increase from 50% to 100%.

c. 4 to 6 hours after a power decrease from 100% to 50%.

d. 10 to 12 hours after shutdown from 100% power.

QUESTION: 018 (1.00)

During fuel loading, which ONE of the following will have NO effect on the shape of the 1/M plot?

a. The order of fuel placement.

b. The source strength.

c. The location of the source in the core.

d. The location of the detector (or detectors) in the core.

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

QUESTION: 019 (1.00)

You enter the control room and observe that the neutron instrumentation indicates a steady neutron level with no rods in motion. Which ONE condition below CANNOT be true?

a. The reactor is critical.

b. The reactor is subcritical.

c. The reactor is supercritical.

d. The neutron source is in the core.

QUESTION: 020 (1.00)

Which ONE of the following describes the response of the reactor to EQUAL amounts of reactivity insertion as the reactor approaches critical (K_{eff} =1.0)?

a. The change in neutron population per reactivity insertion is smaller, and it requires a longer time to reach a new equilibrium count rate.

b. The change in neutron population per reactivity insertion is larger, and it requires a longer time to reach a new equilibrium count rate.

c. The change in neutron population per reactivity insertion is larger, and it takes an equal amount of time to reach a new equilibrium count rate.

d. The change in neutron population per reactivity insertion is smaller, and it requires a shorter time to reach a new equilibrium count rate.

(*****END OF CATEGORY A*****)

QUESTION: 001 (1.00)

The Safety Limit for primary coolant average outlet temperature is:

a. 125 deg F.

b. 155 deg F.

c. 175 deg F.

d. 200 deg C.

QUESTION: 002 (1.00)

The UFTR is _____ when all control blades are inserted and the reactor is subcritical by a margin greater than
_____ % delta k/k.

a. secured; 1.0

b. secured; 2.0

c. shutdown; 1.0

d. shutdown; 2.0

QUESTION: 003 (1.00)

In accordance with the Emergency Plan, severe natural phenomena such as a flood, hurricane or tornado would be classified as a:

a. Class 0 event.

b. Class I event.

c. Class II event.

d. Class III event.

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

QUESTION: 004 (1.00)

_____ are specific indications that may be used as thresholds for establishing accident classes and appropriate emergency measures.

a. Protective Action Guides.

b. Emergency Action Levels.

c. Emergency Procedures.

d. Emergency Classes.

QUESTION: 005 (1.00)

In accordance with the Technical Specifications, which ONE situation below is permissible when the reactor is operating?

a. Diluting fan with an exhaust flow rate of 8,000 cfm.

b. A single non-secured experiment with a reactivity worth of 2 % delta k/k.

c. Small fission product contamination of primary water.

d. Specific resistivity of primary water of 1 megohm-cm.

QUESTION: 006 (1.00)

Limits on important process variables that are found to be necessary to reasonably protect the integrity of certain physical barriers that guard against the uncontrolled release of radioactivity are called:

a. safety limits.

b. limiting conditions for operation.

c. limiting safety system settings.

d. surveillance requirements.

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

QUESTION: 007 (1.00)

The OPERATIONS BOUNDARY is defined as:

a. the reactor building and annex.

b. the main campus.

c. the reactor room.

d. the reactor room and control room.

QUESTION: 008 (1.00)

Class III experiments must be approved by the:

a. Reactor Manager and Facility Director.

b. Facility Director and RSRS.

c. Reactor Manager, Radiation Control Officer and RSRS.

d. Reactor Manager and Radiation Control Officer.

QUESTION: 009 (1.00)

The reactor shall trip when shield water tank level reaches _____ below established normal level.

a. 2 inches.

b. 3 inches.

c. 6 inches.

d. 10 inches.

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

QUESTION: 010 (1.00)

The REACTOR SITE BOUNDARY is defined as:

a. the reactor building and annex.

b. the main campus.

c. the reactor room.

d. the reactor room and control room.

QUESTION: 011 (1.00)

A survey instrument with a window probe is used to measure low energy beta and gamma radiation from an irradiated experiment. The dose rate is 100 mrem/hour with the window open and 60 mrem/hour with the window closed. The gamma dose rate is:

a. 100 mrem/hour.

b. 60 mrem/hour.

c. 40 mrem/hour.

d. 160 mrem/hour.

QUESTION: 012 (1.00)

Following maintenance or modification of the reactor control system, an operability test and calibration of _____ shall be performed before the system is considered operable.

a. the affected portion of the system

b. the entire system

c. all safety systems

d. safety channels

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

QUESTION: 013 (1.00)

The reactor vent system shall be operated at all times during reactor operation and until the stack monitor indicates less than _____ to monitor and record gross concentrations of radioactive gases unless otherwise indicated by one of five facility conditions.

a. 2 cps

b. 5 cps

c. 10 cps

d. 20 cps

QUESTION: 014 (1.00)

A radioactive sample was removed from the reactor core, reading 25 rem/hour. Four (4) hours later, the sample reads 2.5 rem/hour. What is the approximate time required for the sample to decay to 100 mrem/hour from the 2.5 rem/hour point?

a. 1.9 hours.

b. 3.8 hours.

c. 5.6 hours.

d. 7.8 hours.

QUESTION: 015 (1.00)

Which ONE of the following radiation level readings must be reported to the reactor operator upon return of the capsules irradiated in the rabbit system?

a. Radiation dose rate on contact.

b. Glove box reading in cps.

c. Counts from counter top where sample is placed.

d. Background radiation dose rate.

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

QUESTION: 016 (1.00)

Which ONE of the following does NOT require the direction of a licensed Senior Reactor Operator.

a. Fuel bundle insertion into the reactor core.

b. Restart following unscheduled shutdown due to loss of stack rpm indication.

c. Relocation of an irradiated fuel bundle from fuel storage pit #12 to pit #16.

d. Relocation of safety 2 control blade in the core.

(*****END OF CATEGORY B*****)

QUESTION: 001 (1.00)

Which ONE of the following conditions result in a full trip, as opposed to a blade drop trip?

a. High primary coolant temperature.

b. Low primary coolant flow.

c. Loss of secondary coolant flow.

d. Fast period.

QUESTION: 002 (1.00)

The largest insertion of negative reactivity by the reactor protection system is achieved by:

a. inserting all control blade.

b. opening the dump valve.

c. injecting poison into the primary coolant.

d. automatic insertion of hurricane rods.

QUESTION: 003 (1.00)

The Linear Power Channel uses a (an):

a. uncompensated ion chamber.

b. compensated ion chamber.

c. fission chamber.

d. B-10 proportional counter.

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

QUESTION: 004 (1.00)

The UFTR fuel meat is composed of _____ while the fuel plates are clad with _____:

a. aluminum-uranium; aluminum.

b. uranium metal; aluminum-magnesium.

c. uranium metal; stainless steel.

d. aluminum-uranium; stainless steel.

QUESTION: 005 (1.00)

The neutron absorbing material in the control blades is:

a. boron.

b. cadmium.

c. magnesium.

d. graphite.

QUESTION: 006 (1.00)

The purpose of the hole in the top of each shroud surrounding the control blades is to:

a. allow air flow for cooling the control blades.

b. allow access to the blades for lubrication.

c. provide for a means of visual inspection.

d. provide access for maintenance.

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

QUESTION: 007 (1.00)

An extra shield block is usually placed over the primary equipment pit during reactor operation in order to shield against:

a. argon-41.

b. nitrogen-16.

c. hydrogen-3.

d. sodium-24.

QUESTION: 008 (1.00)

At full power, the expected maximum radiation level over the shield tank is _____ with the shield block removed and _____ with the shield block in place.

a. 75 mR/hr; 20 mR/hr.

b. 150 mR/hr; 50 mR/hr.

c. 300 mR/hr; 40 mR/hr.

d. 400 mR/hr; 30 mR/hr.

QUESTION: 009 (1.00)

Which ONE of the following types of detector is used in the area radiation monitors?

a. Geiger-Mueller tube.

b. Scintillation detector.

c. Ionization chamber.

d. Proportional counter.

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

QUESTION: 010 (1.00)

The area radiation monitors provide an amber warning light at _____ and an audible alarm with red light at _____.

a. 2.5 mR/hr; 20 mR/hr.

b. 5.0 mR/hr; 25 mR/hr.

c. 2.5 mR/hr; 10 mR/hr.

d. 5.0 mR/hr; 10 mR/hr.

QUESTION: 011 (1.00)

The demineralizer loop inlet connects to the primary coolant system directly downstream of the:

a. primary coolant pump.

b. coolant storage tank.

c. dump valve.

d. heat exchanger.

QUESTION: 012 (1.00)

The secondary well water drains to the:

a. sanitary sewer.

b. storm sewer.

c. holding tanks in west lot area.

d. dedicated line to the sewer treatment plant.

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

QUESTION: 013 (1.00)

In the Automatic Control mode, the controlling signal is:

a. reactor power as measured by the Linear Power Channel.

b. reactor period as measured by the Period Channel.

c. reactor power as measured by the Wide Range Channel.

d. reactor period as measured by the Linear Power Channel.

QUESTION: 014 (1.00)

Abnormally low dilution fan RPM indication in the control room is probably caused by:

a. debris over the grating.

b. belts too tight.

c. worn fan bearings.

d. imminent mechanical tach-generator failure.

QUESTION: 015 (1.00)

The source count rate blade withdrawal interlock setting is at:

a. 1 cps.

b. 2 cps.

c. 20 cps.

d. 30 cps.

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

QUESTION: 016 (1.00)

The cell air handling/air conditioning system has a manual reset button that must be used to reset the system after:

a. the fire alarm system alarms and is reset.

b. the security system alarms and is reset.

c. the evacuation siren alarms and is reset.

d. power is restored following a building loss of power.

QUESTION: 017 (1.00)

The primary equipment pit has a float switch which is required to alarm at:

a. one gallon of water in the pit.

b. any water in the pit.

c. two inches of water above the pit floor level.

d. one inch of water above the pit floor level.

QUESTION: 018 (1.00)

Which ONE condition below will NOT cause the reactor cell air handle/air conditioner to automatically shut down?

a. Primary coolant pit alarm.

b. Fire alarm actuation by heat sensor.

c. Manual initiation of the evacuation alarm.

d. Automatic initiation of the evacuation alarm.

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

QUESTION: 019 (1.00)

The regulating blade is the control blade with the highest clutch current because:

a. it has the lowest reactivity worth.

b. it moves in the narrowest shroud.

c. it is constantly moving when in automatic control.

d. it has the highest reactivity worth.

QUESTION: 020 (1.00)

In automatic control, regulating blade movement limits the reactor period to no faster than:

a. 10 seconds.

b. 20 seconds.

c. 30 seconds.

d. 50 seconds.

(*****END OF CATEGORY C*****)
(*****END OF EXAMINATION*****)

A. REACTOR THEORY, THERMODYNAMICS & FACILITY OPERATING CHARACTERISTICS

ANSWER: 001 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

ANSWER: 002 (1.00)
A.
REFERENCE:
Principles of Reactor Physics

ANSWER: 003 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

ANSWER: 004 (1.00)
D.
REFERENCE:
Principles of Reactor Physics

ANSWER: 005 (1.00)
A.
REFERENCE:
Principles of Reactor Physics

ANSWER: 006 (1.00)
C.
REFERENCE:
Principles of Reactor Physics

ANSWER: 007 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

ANSWER: 008 (1.00)
B.
REFERENCE:
Principles of Reactor Physics
$P = P_o e^{t/T}$
$P = 75{,}000$ W; $P_0 = 50$ W; $t = 305$ seconds
$T = t/(\ln P/P_0) = 42$ sec.

ANSWER: 009 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

ANSWER: 010 (1.00)
C.
REFERENCE:
Principles of Reactor Physics

ANSWER: 011 (1.00)
D.
REFERENCE:
Principles of Reactor Physics

ANSWER: 012 (1.00)
B.
REFERENCE:
Principles of Reactor Physics
240,000x0.001 = 240 neutron increase; prompt neutrons = 240x(1-beta) = 240x0.993 = 238.

ANSWER: 013 (1.00)
D.
REFERENCE:
Principles of Reactor Physics

ANSWER: 014 (1.00)
C.
REFERENCE:
Principles of Reactor Physics

ANSWER: 015 (1.00)
A.
REFERENCE:
Principles of Reactor Physics
Since K_{eff} decreases, the thermal utilization must decrease.

ANSWER: 016 (1.00)
C.
REFERENCE:
Principles of Reactor Physics
Insertion of a control rod inserts negative reactivity to balance the positive reactivity added when removing a neutron absorber.

ANSWER: 017 (1.00)
D.
REFERENCE:
Principles of Reactor Physics

ANSWER: 018 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

ANSWER: 019 (1.00)
C.
REFERENCE:
Principles of Reactor Physics

ANSWER: 020 (1.00)
B.
REFERENCE:
Principles of Reactor Physics

B. NORMAL/EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS

ANSWER: 001 (1.00)
D.
REFERENCE:
Technical Specifications, Section 2.1

ANSWER: 002 (1.00)
D.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 003 (1.00)
B.
REFERENCE:
Emergency Plan, page 4-2.

ANSWER: 004 (1.00)
B.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 005 (1.00)
D.
REFERENCE:
Technical Specifications, Section 3.8.

ANSWER: 006 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 007 (1.00)
A.
REFERENCE:
Emergency Plan, page 2-2.

ANSWER: 008 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 009 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 010 (1.00)
B.
REFERENCE:
Emergency Plan, page 2-3.

ANSWER: 011 (1.00)
B.
REFERENCE:
Low energy beta radiation cannot penetrate the window, so the gamma dose rate is the dose rate measured with the window closed.

ANSWER: 012 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 013 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 014 (1.00)
C.
REFERENCE:
$DR/DR_o = 0.1 = e^{-\lambda t}$; t = 4 hours ; λ = 0.576/hour
$DR/DR_o = 0.04 = e^{-0.576t}$; t = 5.6 hours.

ANSWER: 015 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 016 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

C. FACILITY AND RADIATION MONITORING SYSTEMS

ANSWER: 001 (1.00)
D.
REFERENCE:
SAR, page 7-15.

ANSWER: 002 (1.00)
B.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 003 (1.00)
B.
REFERENCE:
SAR, page 7-6.

ANSWER: 004 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 005 (1.00)
B.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 006 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 007 (1.00)
B.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 008 (1.00)
D.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 009 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 010 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 011 (1.00)
D.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 012 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 013 (1.00)
A.
REFERENCE:
SAR, page 7-6.

ANSWER: 014 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 015 (1.00)
B.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 016 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 017 (1.00)
D.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 018 (1.00)
A.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 019 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

ANSWER: 020 (1.00)
C.
REFERENCE:
Requalification Program Training Exam.

A. REACTOR THEORY, THERMODYNAMICS & FACILITY OPERATING CHARACTERISTICS

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001	a	b	c	d _____
002	a	b	c	d _____
003	a	b	c	d _____
004	a	b	c	d _____
005	a	b	c	d _____
006	a	b	c	d _____
007	a	b	c	d _____
008	a	b	c	d _____
009	a	b	c	d _____
010	a	b	c	d _____
011	a	b	c	d _____
012	a	b	c	d _____
013	a	b	c	d _____
014	a	b	c	d _____
015	a	b	c	d _____
016	a	b	c	d _____
017	a	b	c	d _____
018	a	b	c	d _____
019	a	b	c	d _____
020	a	b	c	d _____

(***** END OF CATEGORY A *****)

B. NORMAL/EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001	a	b	c	d _____
002	a	b	c	d _____
003	a	b	c	d _____
004	a	b	c	d _____
005	a	b	c	d _____
006	a	b	c	d _____
007	a	b	c	d _____
008	a	b	c	d _____
009	a	b	c	d _____
010	a	b	c	d _____
011	a	b	c	d _____
012	a	b	c	d _____
013	a	b	c	d _____
014	a	b	c	d _____
015	a	b	c	d _____
016	a	b	c	d _____

(***** END OF CATEGORY B *****)

C. FACILITY AND RADIATION MONITORING SYSTEMS

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001	a	b	c	d _____
002	a	b	c	d _____
003	a	b	c	d _____
004	a	b	c	d _____
005	a	b	c	d _____
006	a	b	c	d _____
007	a	b	c	d _____
008	a	b	c	d _____
009	a	b	c	d _____
010	a	b	c	d _____
011	a	b	c	d _____
012	a	b	c	d _____
013	a	b	c	d _____
014	a	b	c	d _____
015	a	b	c	d _____
016	a	b	c	d _____
017	a	b	c	d _____
018	a	b	c	d _____
019	a	b	c	d _____
020	a	b	c	d _____

(***** END OF CATEGORY C *****)

EQUATION SHEET

$Q = mc\Delta T$

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

$\lambda = 0.08 \text{ seconds}^{-1}$

$(DR) = (DR_o)e^{-\lambda t}$

$\rho = (K-1)/K$

$1 \text{ Curie} = 3.7 \times 10^{10} \text{ dps}$

1 Btu = 778 ft-lbf

$1 \text{ MW} = 3.41 \times 10^{6} \text{ BTU/hr}$

$N = S/(1-K)$

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

$\tau = (\mathbb{R}^*/\rho) + [(\beta-\rho)/\lambda\rho]$

$(DR_1)D_1^2 = (DR_2)D_2^2$

$(DR) = 6CiE/D^2$

$(CR_1)\,(1-K_1) = (CR_2)\,(1-K_2)$

1 gallon water = 8.34 pounds

EF = 9/5EC + 32

EC = 5/9 (EF - 32)