July 29, 2006

Dr. Sheldon Landsberger
Nuclear Engineering Teaching Laboratory
10100 Burnet Road
University of Texas at Austin
Austin, TX 78758

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-602/OL-06-02, UNIVERSITY OF TEXAS

Dear Dr. Landsberger:

During the week of June 19, 2006, the NRC administered operator licensing examinations at your Nuclear Engineering Teaching Laboratory. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1.

In accordance with 10 CFR 2.790 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/NRC/ADAMS/indesx.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 Phillip T. Young at 301-415-4094 or via Internet e-mail at pty@nrc.gov.

Sincerely,

Johnny Eads, Chief **/RA by Marvin Mendonca for/**
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-602

Enclosures:
1. Initial Examination Report No. NO. 50-602/OL-06-02
2. Facility comments with NRC resolution
3. Examination and answer key (RO/SRO)

cc w/encls.: Please see next page

cc:

Governor's Budget and
Planning Office
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Austin, TX 78711

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1100 West 49th Street
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Dr. William Vernetson
Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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DISTRIBUTION w/ encls.:
PUBLIC RNRP\R&TR r/f JEads AAdams Facility File (EBarnhill) O-6 F-2

ADAMS ACCESSION #: ML062000460 **TEMPLATE #:NRR-074**
Package No.: ML062000373

OFFICE	PRTB:CE	IOLB:LA	PRTB:SC
NAME	PYoung:tls*	EBarnhill*	MMmendonca for JEads:tls*
DATE	07/21/2006	07/27/2006	07/29/2006

OFFICIAL RECORD COPY

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

REPORT NO.: 50-602/OL-06-02

FACILITY DOCKET NO.: 50-602

FACILITY LICENSE NO.: R-129

FACILITY: University of Texas

EXAMINATION DATES: 06/19 - 20/2006

EXAMINER: Phillip T. Young, Chief Examiner

SUBMITTED BY: **/RA/** 07/21/2006
Phillip T. Young, Chief Examiner Date

SUMMARY:

During the week of June 19, 2006, NRC administered Operator Licensing examinations to one Senior Reactor Operator Upgrade (SROU), one Senior Reactor Operator Instant (SROI) and one Reactor Operator(RO). All candidates passed the examinations.

ENCLOSURE 1

REPORT DETAILS

1. Examiners:

   Phillip T. Young, Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	**1/0**	**1/0**	**2/0**
Operating Tests	**1/0**	**2/0**	**3/0**
Overall	**1/0**	**2/0**	**3/0**

3. Exit Meeting:

   Personnel attending:

   Sean O'Kelly, Associate Director
   Michael G. Krause, Reactor Supervisor
   Phillip Young, NRC

   The examiner thanked the facility for their support in conducting the examinations.

U. S. NUCLEAR REGULATORY COMMISSION
NON-POWER INITIAL REACTOR LICENSE EXAMINATION (Examination with Answer Key}

FACILITY: University of Texas

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 06/19/2006

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 brackets 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	Candidates Score	% of Category Value	Category	
20.00	33.3	_____	____	A.	Reactor Theory, Thermodynamics and Facility Operating Characteristics
20.00	33.3	_____	____	B.	Normal and Emergency Operating Procedures and Radiological Controls
20.00	33.3	_____	____	C.	Facility and Radiation Monitoring Systems
60.00		_____	____% FINAL GRADE		TOTALS

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

_____
Candidate's Signature

Question: A.001 [1.0 point] {1.0}
A core contains fuel with 20% U^{235} and 80% U^{238}. From the following data, what is the probability that fission will occur when the fuel absorbs a thermal neutron?

Isotope	σ_f	σ_c
U^{235}	582 barns	99 barns
U^{238}	0 barns	3 barns

a. 0.833
b. 0.840
c. 0.851
d. 0.855

Answer: A.001 b.
Reference: UT-TRIGA Training Manual, Vol. IV, Interactions of Neutrons with Matter. Probability = $\Sigma_f/(\Sigma_f + \Sigma_c) = (0.2x582)/(0.2x582 + 0.2x99 + 0.8x3) = 0.840$

Question: A.002 [1.0 point] {2.0}
Which ONE of the following conditions describes a critical reactor?

a. $K_{eff} = 1$; $\Delta k/k$ (ρ) = 1
b. $K_{eff} = 1$; $\Delta k/k$ (ρ) = 0
c. $K_{eff} = 0$; $\Delta k/k$ (ρ) = 1
d. $K_{eff} = 0$; $\Delta k/k$ (ρ) = 0

Answer: A.002 b.
Reference: Burn, R., Intro to Nuclear Reactor Operations, © 1984, § 3.3.4, pp. 3-23.

Question: A.003 [1.0 point] {3.0}
Which ONE of the following describes 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.003 a.
Reference: Burn, R., Intro to Nuclear Reactor Operations, © 1985, § 2.8.9, pp. 2-63.

Question: A.004 [1.0 point] {4.0}
As a reactor continues to operate over a period of months, 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.004 c.
Reference: Burn, R., Intro to Nuclear Reactor Operations, © 1984, § 3.4.8, pp. 3-36.

Question: A.005 [1.0 point] {5.0}
In choosing a Fuel-Moderator material ZrH ratio of 1.6, the limiting effect or factor verses other ratios is the:

a. relative widely spaced cracks that occur, in higher ratios, due to the elevated temperatures produced by pulsing

b. large volume changes associated with the with the phase transformations that occur in higher ratios.

c. zirconium hydride chemical reactivity rate with water associated with lower ratios.

d. hydrogen gas over pressure at higher fuel temperatures.

Answer: A.005 d.
Reference: UT-TRIGA SAR 4.1 page 4-4

Question: A.006 [1.0 point] {06.0}
Which ONE of the following factors is the most significant in determining the differential worth of a control rod?

a. The rod speed.

b. Reactor power.

c. The flux shape.

d. The amount of fuel in the core.

Answer: A.013 c
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

Question: A.007 [1.0 point] {7.0}
The reactor supervisor tells you the reactor is shutdown with a shutdown margin of 12%. An experimenter inserts an experiment in the core and nuclear instrumentation increases from 100 counts per minute to 200 counts per minute. What is the new K_{eff} of the reactor?

a. 0.920
b. 0.946
c. 0.973
d. 1.000

Answer: A.007 b
Reference: Standard NRC Question:

$$K_{eff_1} = \frac{1}{1 + SDM} = \frac{1}{1 + 0.12} = 0.892857$$

$$CR_1(1 - K_{eff_1}) = CR_2(1 - K_{eff_2});$$

$$1 - K_{eff_2} = \frac{100}{200}(1 - 0.892857) = (0.0535715)$$

$$K_{eff_2} = 0.9464285$$

Question: A.008 [1.0 point] {8.0}

The PRIMARY reason that a neutron source is installed in the reactor is to …

a. allow for testing and irradiation of experiments when the core is shutdown.
b. supply the neutrons required to start the chain reaction for reactor startups.
c. provide a neutron level high enough to be monitored for a controlled reactor startup.
d. increase the excess reactivity of the reactor which reduces the frequency for refueling.

Answer: A.008 c
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

Question: A.009 [1.0 point] {9.0}
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.009 c.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

Question: A.010 [1.0 point] {10.0}
Reactor Power increases from 15 watts to 65 watts in 30 seconds. The period of the reactor is:

a. 7 seconds

b. 14 seconds

c. 21 seconds

d. 28 seconds

Answer: A.010 c
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §
$P = P_0 e^{t/\tau}$, $\ln(65/15) = 30\text{sec}/\tau$ $\tau = (30 \text{ sec})/(\ln 4.3333) = 20.456$

Question: A.011 [1.0 point] {11.0}
Two different neutron sources were used during two reactor startups. The source used in the first startup emits ten times as many neutrons per second as the source used in the second startup. Assume all other factors are the same for the second startup. Which ONE of the following states the expected result at criticality?

a. Neutron flux will be higher for the first startup.

b. Neutron flux will be higher for the second startup.

c. The first startup will result in a higher rod position (rods further out of the core).

d. The second startup will result in a higher rod position (rods further out of the core).

Answer: A.011 a.
Reference: UT-TRIGA Trn Manual, Vol. IV, Nuclear Physics & Rx Theory, Module 4, pg. 2.

Question: A.012 [1.0 point] {12.0}
Which ONE of the following is the description of a thermal neutron?

a. A neutron possessing thermal rather than kinetic energy.

b. The primary source of thermal energy increase in the reactor coolant during reactor operation.

c. A neutron that has been produced in a significant time (on the order of seconds) after its initiating fission took place.

d. A neutron that experiences no net change in energy after several collisions with atoms of the diffusing media.

Answer: A.012 d.
Reference:UT-TRIGA Trn Manual, Vol. IV, Nuclear Physics & Rx Theory, Module 2, pg. 23.

Question: A.013 [1.0 point] {12.0}
The fuel temperature coefficient of reactivity is -1.25×10^{-4} delta k/k/deg.C. When a control rod with an average rod worth of 0.1 % delta k/k/inch is withdrawn 10 inches, reactor power increases and becomes stable at a higher level. At this point, the fuel temperature has:

a. increased by 80 degrees C.
b. decreased by 80 degrees C.
c. increased by 8 degrees C.
d. decreased by 8 degrees C.

Answer: A.013 a.
Reference:UT-TRIGA Trn Manual, Vol. IV, Nuclear Physics & Rx Theory, Module 3, pg. 21.
Positive reactivity added by control rod = (0.001 ΔK/K/inch)(10 inches) = +0.01 ΔK/K. This balances the negative reactivity of the fuel temperature change: $(-0.01\ \Delta K/K)/(-1.25 \times 10^{-4}\ \Delta K/K/deg.C) = +80$ deg. C.

Question: A.014 [1.0 point] {14.0}
Which ONE of the following is the principal source of energy (heat generation) in the reactor 15 minutes following a reactor shutdown from extended operation at full power?

a. Production of delayed neutrons.
b. Subcritical multiplication of neutrons.
c. Spontaneous fission of U-238.
d. Decay of fission products.

Answer: A.014 d.
Reference:UT-TRIGA Trn Manual, Vol. IV, Nuclear Physics & Rx Theory,, Module 4, pg. 33.

Question: A.015 [1.0 point] {15.0}
A reactor is subcritical with a K_{eff} of 0.984. and a count rate of 1500 cps on the startup instrumentation. Rods are withdrawn until the count rate is 6000 cps. At this point, the value of K_{eff} is:

a. 0.992
b. 0.994
c. 0.996
d. 0.998

Answer: A. 015 c.
Reference:UT-TRIGA Trn Manual, Vol. IV, Nuclear Physics & Rx Theory, Module 4, pg. 6.
CR1/CR2 = (1 - K2)/(1 - K1) ; 1500/6000 = (1 - K2)/(1 - 0.984) ; K2 = 0.996

Question: A.016 [1.0 point] {16.0}
Which ONE of the following is the reason for operating with thermal neutrons rather than fast neutrons?

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

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

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.

Answer: A. 016 c.
Reference: UT-TRIGA Trn Man, Vol. IV, Nuclear Physics & Rx Theory, Module 2, pg. 9.

Question: A.017 [1.0 point] {17.0}
The equations which describe the operation of the installed neutron source at the UT reactor are:

a. Am-241 -> alpha + Np-237
Be-9 + alpha -> C-12 + neutron

b. Am-241 -> alpha + Np-237
B-10 + alpha -> N-13 + neutron

c. Am-241 -> beta + Cm-241
Be-9 + beta -> Li-8 + neutron

d. Am-241 -> beta + Cm-241
B-10 + beta -> Be-9 + neutron

Answer: A. 017 a.
Reference:UT-TRIGA Trn Manual, Vol. II, Description of TRIGA Mark II Rx, pg. 16.

Question: A.018 [1.0 point] {18.0}
Which factor in the six-factor formula is represented by the ratio:

$$\frac{\text{number of neutrons that reach thermal energy}}{\text{number of neutrons that start to slow down}}$$

a. fast non-leakage probability

b. resonance escape probability

c. reproduction factor

d. thermal utilization factor

Answer: A.018 b.
Reference: UT-TRIGA Training Manual, Vol. IV, Nuclear Physics and Reactor Theory, Module 3, pg. 3.

Question: A.019 [1.0 point] {19.0}
Which one of the following is the definition of the FAST FISSION FACTOR?

a. The ratio of the number of neutrons produced by fast fission to the number produced by thermal fission

b. The ratio of the number of neutrons produced by thermal fission to the number produced by fast fission

c. The ratio of the number of neutrons produced by fast and thermal fission to the number produced by thermal fission

d. The ratio of the number of neutrons produced by fast fission to the number produced by fast and thermal fission

Answer: A.019 c.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 3.3.1 p. 3-16.

Question: A.020 [1.0 point] {20.0}

Which one of the following factors has the **LEAST** effect on K_{eff}?

a. Fuel burnup.

b. Increase in moderator temperature.

c. Increase in fuel temperature.

d. Xenon and samarium fission products.

Answer: A.020 a.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 3.3.2, p. 3-18.

END OF SECTION 'A' REACTOR THEORY, THERMODYNAMICS and FACILITY OPERATING CHARACTERISTICS

Question: B.001 [1.0 point] {1.0}
Which ONE of the following types of experiments is NOT required to be doubly encapsulated? Experiments which contain …

a. explosive materials.
b. solid fissionable materials
c. compounds highly reactive with water.
d. materials corrosive to reactor components.

Answer: B.001 b.
Reference: Technical Specification 3.4.2.a

Question: B.002 [2.0 points, 0.5 each] {3.0}
Match the type of radiation in column A with its associated Quality Factor (10CFR20) from column B.

Column A	Column B
a. alpha	1
b. beta	2
c. gamma	5
d. neutron (unknown energy)	10
	20

Answer: B.002 a. = 20; b. = 1; c. = 1; d. = 10
Reference: 10CFR20.100x

Question: B.003 [1.0 point] {4.0}
Which ONE of the following is NOT a condition for the Technical Specification limit on Shutdown Margin?

a. All experiments in most reactive state.
b. Core at maximum Xenon concentration.
c. Most reactive rod in fully out position.
d. Core at ambient temperature.

Answer: B.003 b.
Reference: Tech Spec§ 1.20 Definition of Reference Core and § 3.1.4 Shutdown Margin.

Question: B.004 [1.0 point, 0.25 each] {5.0}
Identify the PRIMARY source (irradiation of **air**, irradiation of **water**, or **fission** product) of EACH of the radioisotopes listed.

a. $_{1}H^{3}$

b. $_{18}Ar^{41}$

c. $7N^{16}$

d. $_{54}Xe^{135}$

Answer: B.006 a. = Water; b. = Air; c. = Water;d. = Fission
Reference: Standard NRC Question

Question: B.005 [1.0 point] {6.0}
The reactor has been shutdown following operations which achieved 1200 kW. WHO may authorize restart of the Reactor?

a. The Reactor Supervisor

b. The Facility Director

c. The Reactor Operations Committee

d. The Nuclear Regulatory Commission

Answer: B.005 d.
Reference: Tech. Specs, § 6.5.1.a Action to be taken in the Event a Safety Limit is Exceeded. p. 32.

Question: B.006 [1.0 point] {7.0}
The radiological design goal for the accessible areas of the pool water system and shield structure is _____ .

a. 0.5mrem/hour

b. 1.0mrem/hour

c. <2.5mrem/hour

d. $\leq$5.0mrem/hour at the hottest spot

Answer: B.006 b.
Reference: SAR 7.2.1 page 7-2

Question: B.007 [1.0 point] {8.0}
During work in a Restricted Area the pocket dosimeter is required to be checked periodically and re-zeroed when it reads _____ of scale.

a. 65%
b. 75%
c. 85%
d. 95%

Answer: B.007 b.
Reference: HP00-1 Radiation Monitoring - Personnel

Question: B.008 [1.0 point] {9.0}
For a radiation worker at NETL to exceed the facility individual dose limits, written permission is required from the _____ .

a. Health Physicst
b. Radiation Safety Officer
c. Facility Director
d. Reactor Supervisor and Nuclear Reactor Committee

Answer: B.008 c.
Reference: HP00-3 NETL ALARA Program

Question: B.009 [1.0 points, ¼ point each] {10.0}
Match the Federal Regulation number in column A with the appropriate topic in column B.

a. 10 CFR 20	1. Operator Licenses
b. 10 CFR 50	2. Facility Licenses
c. 10 CFR 55	3. Radiation Protection
d. 10 CFR 73	4. Special Nuclear Material

Answer: B.009 a. = 3; b. = 2; c. = 1; d. = 4.
Reference: Title 10 to the Code of Federal Regulations.

Question: B.010 [2.0 points, ½ each] {12.0}
Match type of radiation (a thru d) with the proper penetrating power (1 thru 4)

a. Gamma	1. Stopped by thin sheet of paper
b. Beta	2. Stopped by thin sheet of metal
c. Alpha	3. Best shielded by light material
d. Neutron	4. Best shielded by dense material

Answer: B.010 a. = 4; b. = 2; c. = 1 d. = 3
Reference: Standard NRC Question:

Question: B.011 [1.0 point] {13.0}
An experiment is removed from the reactor with a radiation level of 10R/hr at 1 foot. The radioisotope has a half-life of 120 seconds. Approximately how long must you let the experiment decay before the radiation level has decreased by a factor of 1000?

a. 600 seconds (ten minutes)

b. 1200 seconds (twenty minutes)

c. 6000 seconds (1hour 40 minutes)

d. 12000 seconds (3 hours 20 minutes)

Answer: B.011 b.
Reference: Standard NRC OL-04-02 Question $1/1000 \approx ½^{10}$

Question: B.012 [1.0 point] {14.0}
Which ONE of the following requires the direct supervision (i.e., presence) of a Senior Reactor Operator?

a. Control rod calibrations.

b. Fuel temperature calibrations.

c. Pulsing the reactor.

d. Performance of a Class A experiment.

Answer: B.012 d.
Reference: ADMN-6, Authorization of Experiments.

Question: B.013 [1.0 point] {15.0}
With regard to Radiation Work Permits (RWPs), which ONE of the following statements is NOT TRUE?

a. All personnel who work under an RWP must read and sign it.

b. The RWP is closed out by the person (or persons) who actually perform the work.

c. An RWP is issued for a specific time period, and may expire prior to the completion of work.

d. If the potential for personnel exposure exceeds 100 mrem, the RWP must be approved by the ALARA committee.

Answer: B.013 b.
Reference: HP-7, Radiation Work Permits.

Question: B.014 [1.0 point] {16.0}
In accordance with the Technical Specifications, which ONE situation below is permissible when the reactor is operating?:

a. One control rod inoperable but fully inserted in the core.

b. Pool water depth = 5.0 meters.

c. A fueled experiment containing 400 millicuries of I-133 and 400 millicuries of I-135.

d. Maximum reactivity insertion rate of a standard control rod = 0.12%ΔK/K.

Answer: B.014 d.
Reference: UT-TRIGA Reactor Technical Specifications, Section 3.2.1c.

Question: B.015 [1.0 point] {17.0}
Which ONE of the following statements define the Technical Specifications term "Channel Test?"

a. The introduction of a signal into a channel for verification of the operability of the channel

b. The qualitative verification of acceptable performance by observation of channel behavior

c. The combination of sensors, electronic circuits and output devices connected to measure and display the value of a parameter

d. The adjustment of a channel such that its output corresponds with acceptable accuracy to known values of the parameter which the channel measures

Answer: B.015 a.
Reference: UT-TRIGA Reactor Technical Specifications, Section 1.0

Question: B.016 [1.0 point] {18.0}
Which ONE of the following is the 10 CFR 20 definition of TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)?

a. The sum of the deep dose equivalent and the committed effective dose equivalent.

b. The dose that your whole body receives from sources outside the body.

c. The sum of the external deep dose and the organ dose.

d. The dose to a specific organ or tissue resulting from an intake of radioactive material.

Answer: B.016 a.
Reference: 10 CFR 20.1003, Definitions

Question: B.017 [1.0 point] {19.0}
Which one of the following statements concerning the Fuel Temperature Limiting Safety System Setting is FALSE?

a. The LSSS is not applicable in the pulse mode because of the relatively long time constant of the fuel temperature channel.

b. Two redundant temperature thermocouple sensors monitor the fuel temperature LSSS.

c. The trip level provides a margin of 400 °C for in any condition of operation.

d. The LSSS prevents the safety limit from being reached.

Answer: B.017 a.
Reference:SOP II, REACTOR OPERATIONS, C.6, and 10 CFR 50.36

Question: B.018 [1.0 point] {20.0}
A person who is granted unescorted access to restricted areas only would be issued a:

a. white badge.

b. red badge.

c. green badge.

d. yellow badge.

Answer: B. 009 c.
Reference:NETL Security Badge Policy.

END OF SECTION ‘B’ NORMAL/EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS

Question: C.001 [1.0 point] {1.0}
Which ONE of the following detectors is used to detect the amount Ar^{41} released to the environment?

a. NONE, Ar^{41} has too short a half-life to require environmental monitoring.
b. Stack Gas Monitor
c. Stack Particulate Monitor
d. Bridge Area Monitor

Answer: C.001 b
Reference: Standard NRC Exam Question:

Question: C.002 [1.0 point] {2.0}
In order to minimize release of Ar41 from the pneumatic tube (rabbit) system, the …

a. piping is a recirculating loop with an N2 purge.
b. piping is a recirculating loop with a CO2 purge.
c. exhaust of the system is located in the facility exhaust stack.
d. exhaust of the system is connected to the Ar41 purge system.

Answer: C.002 b.
Reference: UT TRIGA - Operation Support Systems, 3.2, Pneumatic Transfer System page 21

Question: C.003 [1.0 point] {3.0}
The reactor protection system will generate a scram signal if neutron detector high voltage drops by …

a. 10%
b. 20%
c. 80%
d. 90%

Answer: C.003 a.
Reference: UT TRIGA - R̶ Description, Reactor Instrumentation and Controls § 2.1.6.2.2 on page 29.
(Note: hand written change from 20% to 10%.)

Question: C.004 [1.0 point] {4.0}
Each fuel element contains a top and bottom reflector plugs which are made of …

a. graphite
b. zirconium
c. Stainless Steel
d. zirconium hydride

Answer: C.004 a.
Reference: SAR § 4.4.5 2nd ¶.

Question: C.005 [1.0 point] {5.0}
WHICH ONE of the following experimental facilities can be modified to supply a highly collimated beam of neutron and gamma radiation?

a. Pneumatic Transfer system
b. Hollow Element Assembly
c. Central Thimble
d. Lazy Susan

Answer: C.005 c.
Reference: UT TRIGA - Operational Support Systems, § 3.3, p. 21.

Question: C.006 [1.0 point] {6.0}
Which ONE of the following is the neutron absorbing medium in the control rods?

a. Boron carbide
b. Samarium
c. Halfnium
d. Xenon

Answer: C.006 a.
Reference: UT TRIGA - Rx Description, § 3.7, 1st and 3rd paragraphs page 18

Question: C.007 [1.0 point] {7.0}
You are the reactor operator and the reactor is in the AUTOMATIC mode at a power level of 900 kW. You observe that shim rod number one rod color is MAGENTA and the magnet box is BLACK. Which one of the following results would you expect to see as a result of these indications?

a. the control system drops out of the AUTOMATIC mode into the MANUAL mode.
b. the control system withdraws the regulating rod.
c. the control system inserts the regulating rod.
d. the reactor scrams.

Answer: C.007 a.
Reference: UT-TRIGA Trn Man, Vol. II, Control Console Operator's Manual, page 5-3 and UT-TRIGA Trn Man, Vol. II, Rx I & C Systems, page 26.

Question: C.008 [1.0 point] {8.0}
The pool level indications are provided by ___ dowels (rods) positioned by ___ floats.

a. 2 dowels and 5 floats
b. 2 dowels and 4 floats
c. 3 dowels and 3 floats
d. 5 dowels and 5 floats

Answer: C.008 a.
Reference: SURV-4, Reactor Water Systems Surveillance step B.1.f and MAIN-3, Support System Features step B.1 - B.4

Question: C.009 [1.0 point] {9.0}
Which ONE of the following temperature measuring devices utilizes the presence of a temperature difference that can be seen by the voltage generated between two dissimilar metals?

a. Resistance temperature detector
b. Bimetallic thermometer
c. Thermocouple
d. Thermistor

Answer: C.009 c.
Reference: SURV-4, Reactor Water Systems Surveillance step B.1.f and MAIN-3, Support System Features step B.1 - B.4

Question: C.010 [1.0 point] {10.0}
Which ONE of the following neutron flux detectors provides a signal indicating the Log N period of the reactor?

a. Fission chamber
b. Gamma ion chamber
c. Compensated ion chamber
d. Uncompensated ion chamber

Answer: C.010 a.
Reference: UT-TRIGA Trn Man, Vol.II, Reactor I and C Systems, page 15.

Question: C.011 [1.0 point] {11.0}
The fuel-moderator elements are:

a. 20% enriched uranium clad with zirconium.

b. 8.5% enriched uranium clad with stainless steel.

c. 20% enriched uranium clad with stainless steel.

d. 8.5% enriched uranium clad with zirconium.

Answer: C.011 c.
Reference: SAR, page 4-59.

Question: C.012 [1.0 point] {12.0}
Which ONE of the following conditions will prevent rod withdrawal?

a. Compensating voltage is 20% lower than normal.

b. The reactor operator selects pulse mode and attempts to withdraw the shim rod.

c. Rods are being pulled for a reactor startup. Source count 1.4 cps.

d. The demineralizer inlet temperature is 40˚C.

Answer: C.012 b.
Reference: Reactor Description, Section 2.1.7

Question: C.013 [1.0 point] {13.0}
A control rod is partially withdrawn from the core. At this point, the source level, for some unknown reason, drops below the minimum count. As a result:

a. the control rod cannot be withdrawn any further.

b. the control rod cannot be moved in any direction.

c. the control rod can only be inserted by means of a SCRAM.

d. the control rod can only be inserted by placing the key switch in the “OFF” position.

Answer: C.013 a.
Reference: UT-TRIGA Training Manual, Vol. II, Description of TRIGA Mark II Reactor, page 31.

Question: C.014 [1.0 point] {14.0}
Which ONE of the following conditions is NOT required in order to place the reactor into the PULSE mode?

a. The transient rod is all the way down.

b. Reactor power is less than 1 kW.

c. Air is applied to the transient rod drive.

d. The system is in the Steady State Mode.

Answer: C.014 c.

Reference: UT-TRIGA Training Manual, Vol. II, GA Operation and Maintenance Manual, page 28.

Question: C.015 [1.0 point] {15.0}
In order to prevent leakage of primary coolant into the secondary system, a positive pressure difference is maintained between the heat exchanger:

a. tube inlet and tube outlet.

b. shell inlet and shell outlet.

c. shell outlet and tube inlet.

d. shell inlet and tube outlet.

Answer: C.015 c.
Reference: SAR 5.2.1.

Question: C. 016 [1.0 point] {16.0}
There are small holes at various positions in the top grid plate. These holes are provided in order to:

a. ensure unimpeded coolant flow through the core.

b. ensure proper alignment of the top and bottom grid plates.

c. permit insertion of wires or foils into the core to obtain flux data.

d. allow thermocouple leads from instrumented fuel elements to pass out of the core.

Answer: C. 016 c.
Reference: SAR 4.4.3.

Question: C. 017 [1.0 point] {17.0}
During reactor operation, the HVAC system may be operated in the REACTOR OFF mode, provided that:

a. reactor power is less than 100 kW.

b. reactor operation is less than eight (8) hours duration.

c. the air particulate monitor is operable.

d. the argon purge system is operating.

Answer: C.017 d.
Reference: OPER-5.

Question: C. 018 [1.0 point] {18.0}
The reactor is operating at full power in the STEADY STATE mode. The operator depresses the PULSE mode switch on the console. As a result:

a. the reactor scrams.

b. the reactor enters the PULSE mode.

c. the reactor enters the PULSE mode and then scrams.

d. the reactor remains in the STEADY STATE mode.

Answer: C.018 d.
Reference: Control Console Operator's Manual, page 6-1.

Question: C.019 [1.0 point] {19.0}
Which one of the following is the primary purpose of the safety plate assembly?

a. Provide additional support to the reactor grid plate to accommodate the transient rod.

b. Ensure proper alignment of the shim-safety, regulating and transient rods.

c. Retain a shim-safety rod fuel follower if it becomes detached from its mounting.

d. Retain any debris resulting from an accident which has directly involved the fuel elements.

Answer: C.019 c.
Reference: SAR 4.4.4

Question: C.020 [1.0 point] {20.0}
The pneumatic sample system has several design features including:

a. An override so the control room can return a sample from the reactor to its origin.

b. The use of dry compressed CO2 to minimize production of Ar-41.

c. Control room permissive for each remote sample station.

d. Automatic return override if the samples get more exposure than expected.

Answer: C.020 b.
Reference: Support Systems 3.2

END OF SECTION 'C FACILITY AND RADIATION MONITORING SYSTEMS

END OF EXAMINATION