UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 17, 1996

Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
Atlanta, Georgia 30332

Dear Dr. Karam:

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-160/OL-95-01

During the weeks of November 13, 1995 and December 11, 1995, the NRC administered an initial examination to employees of your facility who had applied for a license to operate your Georgia Institute of Technology Research Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards." Revision 1. At the conclusion of the operating tests and the written examination, exit meetings were held with those members of the Georgia Institute of Technology Research Reactor staff identified in the enclosed report.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the attachments will be placed in the NRC Public Document Room.

Should you have any questions concerning this examination, please contact Mr. Marvin M. Mendonca of my staff at (301) 415-1128.

Sincerely,

Seymour H. Weiss

Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-160

Attachments:
1. Initial Examination Report No. 50-160/OL-95-01
2. Facility comments and NRC resolution of comments
3. Examination and answer key

cc w/attachments:
See next page

DF03
'11

Georgia Institute of Technology

Docket No. 50-160

cc:

Mr. Charles H. Badger
Office of Planning and Budget
Room 608
270 Washington Street, S.W.
Atlanta, Georgia 30334

Mayor of City of Atlanta
55 Trinity Avenue, S.W.
Suite 2400
Atlanta, Georgia 30303

Dr. G. Poehlein
Vice President for Interdisciplinary Programs
Georgia Institute of Technology
225 North Avenue
Atlanta, Georgia 30332

Dr. William Vernetson
Director of Nuclear Facilities
Department of Nuclear Engineering Sciences
University of Florida
202 Nuclear Sciences Center
Gainesville, Florida 32611

Mr. Pedro B. Perez, Associate Director
Nuclear Reactor Program
North Carolina State University
P. O. Box 7909
Raleigh, North Carolina 27695-7909

Dr. R. U. Mulder, Director
UVA Reactor Facility
Dept. of Nuclear Engineering
Charlottesville, Virginia 22903-2442

Joe D. Tanner, Commissioner
Department of Natural Resources
47 Trinity Avenue, S.W.
Atlanta, Georgia 30334

Dr. Rodney Ice, MORS
Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive
Atlanta, Georgia 30332-0425

Ms. Pamela Blockey-O'Brien
D23 Golden Valley
Douglasville, Georgia 30134

Mr. E. F. Cobb
Southern Nuclear Company
42 Inverness Center
Birmingham, Alabama 35242

Dr. G. Wayne Clough, President
Georgia Institute of Technology
Carnegie Building
Atlanta, Georgia 30332-0325

Ms. Glenn Carroll
139 Kings Highway
Decatur, Georgia 30030

Charles Bechhoefer, Chairman
Atomic Safety and Licensing Board Panel
U.S. NRC
Washington, D.C. 20555-0001

Dr. Jerry R. Kline
Atomic Safety and Licensing Board Panel
U.S. NRC
Washington, D.C. 20555-0001

Dr. Peter S. Lam
Atomic Safety and Licensing Board Panel
U.S. NRC
Washington, D.C. 20555-0001

Mr. James C. Hardeman, Jr.
Manager Environmental Radiation Program
Environmental Protection Division
Dept. of Natural Resources
State of Georgia
4244 International Parkway Suite 114
Atlanta, Georgia 30354

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

REPORT NO.:	50-160/OL-95-01
FACILITY DOCKET NO.:	50-160
FACILITY LICENSE NO.:	R-97
FACILITY:	Georgia Institute of Technology Research Reactor
EXAMINATION DATES:	November 13, 14, 16, and December 13, 1995
EXAMINER:	Marvin M. Mendonca, Chief Examiner Paul V. Doyle, Jr., Examiner

SUBMITTED BY: M. M. Mendonca 1/17/95

Marvin M. Mendonca, Chief Examiner — Date

SUMMARY: The NRC administered an operating test to two Senior Reactor Operator Upgrade (SRO-U) candidates, and a written examination and an operating test to four initial Reactor Operator (RO) candidates.

ATTACHMENT 1

REPORT DETAILS

1. Examiners: Marvin M. Mendonca, Chief Examiner
   Paul V. Doyle Jr., Examiner

2. Results:

	RO (Pass/Fail)	SRO (Pass/Fail)	Total (Pass/Fail)
NRC Grading:	2/2	2/0	4/2

3. Written Examination: The NRC administered a written examination to four Reactor Operator candidates. Two of the four candidates passed the written examination. Two candidates failed section B only.

4. Operating Tests: All six license candidates passed their respective operating tests.

5. Exit Meetings:

November 16, 1995

Marvin M. Mendonca, Chief Examiner
Paul V. Doyle, Jr., Examiner
Ratib A. Karam, Director of the Neely Nuclear Research Center
Billy Statham, Senior Reactor Operator

During the exit meeting, Mr. Mendonca and Mr. Doyle thanked Dr. Karam and Mr. Statham for their and the Georgia Institute of Technology Research Reactor staff support during the administration of the operating tests. The examiners concluded that there were no generic concerns identified during the examination process.

December 13, 1995

Marvin M. Mendonca, Chief Examiner
Dixon F. Parker, Reactor Supervisor

Mr. Parker provided preliminary comments on the written examination. The examiner emphasized the importance of submitting any written examination comments in a timely manner.

Facility Comments followed by
NRC Resolutions

ATTACHMENT 2

Question (B.3):

The biomedical facility is to be used for boron neutron capture therapy (BNCT). The dose rate at one yard from the aperture is 500 rads/hr. Which one of the following is the expected MINIMUM Radiation Posting for the area during BNCT?

a. DANGER, RADIOACTIVE MATERIAL
b. DANGER, RADIATION AREA
c. DANGER, HIGH RADIATION AREA
d. GRAVE DANGER, VERY HIGH RADIATION AREA

The answer is given as (d) and refers to 10CFR20 and Procedure 9310.

Comments (B.3):

10CFR20.1003 defines a very high radiation area as "an area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from any surface that the radiation penetrates."

Procedure 9310 defines a very high radiation area as "Any area in which the potential exists to expose individuals to radiation in excess of 500 rads/hr at 1 meter.

The radiation field in the question is stated the as equal to 500 rads/hr at 1 yard. The field would be less than 500 rads/hr at 1 meter. Therefore the correct MINIMUM posting for the area would be DANGER, HIGH RADIATION AREA.

Suggestion (B.3):

Change the correct answer to (c)

Question (B.11):

Which one of the following describes the MINIMUM requirements for an individual to tag equipment out of service?

a. Any person who uses the equipment
b. Reactor operators.
c. Senior reactor operators.
d. The reactor supervisor.

*The answer is given as (a) and refers to Procedure 4950

Comments (B.11):

Procedure 4950 applies to tagging equipment and/or instrumentation used to perform measurements for fulfilling regulatory or Technical Specification requirements. The procedure states that each person at the NNRC is responsible for the implementation of the procedure.

During training at the GTRR students perform tasks under the guidance of licensed operators. Students do not perform activities required by the Technical Specifications without the review of licensed personnel. If a student believes that equipment is not functioning properly they are instructed to immediately notify the licensed operator working with them. If the operator believes that the equipment is not functioning properly then the operator will implement procedure 4950. This operational practice prevents unknowledgable personnel from removing functioning equipment from service. Therefore answer b, reactor operators, is applicable to this question.

Suggestion (B.11):

Permit answers (a) and (b).

Question (B.17):

Which one of the following is a Reportable Occurrence...?

a. The high thermal power safety system trip setting was found to be 5.3 MW.
b. The duty SRO is made aware that the two Reactor D_2O flow rate channels low flow setpoints are at 1800 gallons per minute.
c. A unexpected reactivity change of 0.004 delta k/k
d. Operating with a resistivity of 80,000 ohm-cm.

*The answer was given as b and references the technical specifications sections 1.0, 2.2.1, 3.6, 4.2.a, and Table 4.1.

Comments (B.17):

Referring to the sections of the technical specifications above, none of the answers constitute reportable occurrences.

Suggestion (B.17):

Remove the question.

NRC Resolutions to Facility Comments

Question B.3: AGREE

This was a typographical error in the answer key. The answer key has been modified to show c as the correct answer.

Question B.11: AGREE

The answer key has been modified to show "a" and "b" as correct.

Question B.17: AGREE

This was a typographical error in one of the answers. The answer key has been modified to delete this question.

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

FACILITY: Georgia Tech

REACTOR TYPE: RESEARCH

DATE ADMINISTERED: 1995/12/13

CANDIDATE: ______________________

INSTRUCTIONS TO CANDIDATE:
Answers are to be written on the answer sheets provided. Attach the answer sheets to the examination. Points for each question are indicated in paren-theses for each question. A 70% overall 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
20.00	33.90	______	______	A.	REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS
19.00	32.20	______	______	B.	NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
20.00	33.90	______	______	C.	FACILITY AND RADIATION MONITORING SYSTEMS
59.00		______ FINAL GRADE	______%		TOTALS

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

____

Candidate's Signature

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 <u>only</u> 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.

13. When you have completed and turned in you examination, leave the examination area. If you are observed in this area while the examination is still in progress, your license may be denied or revoked.

EQUATION SHEET

$$\dot{Q} = \dot{m}c_p\,\Delta T = \dot{m}\,\Delta H = UA\,\Delta T$$

$$P_{max} = \frac{(\rho-\beta)^2}{2\alpha(k)\ell}$$

$$\ell^* = 1 \times 10^{-4}\ seconds$$

$$SCR = \frac{S}{-\rho} \approx \frac{S}{1-K_{eff}}$$

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

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

$$CR_1(-\rho_1) = CR_2(-\rho_2)$$

$$SUR = 26.06\left[\frac{\lambda_{eff}\rho}{\beta-\rho}\right]$$

$$M = \frac{1-K_{eff_0}}{1-K_{eff_1}}$$

$$M = \frac{1}{1-K_{eff}} = \frac{CR_1}{CR_2}$$

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

$$SDM = \frac{(1-K_{eff})}{K_{eff}}$$

$$P = P_0\ e^{\frac{t}{T}}$$

$$T = \frac{\ell^*}{\rho - \bar{\beta}}$$

$$P = \frac{\beta(1-\rho)}{\beta-\rho}\ P_0$$

$$\Delta\rho = \frac{K_{eff_2}-K_{eff_1}}{k_{eff_1}\times K_{eff_2}}$$

$$T = \frac{\ell^*}{\rho} + \left[\frac{\bar{\beta}-\rho}{\lambda_{eff}\rho}\right]$$

$$T_{1/2} = \frac{0.693}{\lambda}$$

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

$$DR = DR_0\ e^{-\lambda t}$$

$$DR_1 d_1^2 = DR_2 d_2^2$$

$$DR = \frac{6CiE(n)}{R^2}$$

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

$$\frac{(\rho_2-\beta)^2}{Peak_2} = \frac{(\rho_1-\beta)^2}{Peak_1}$$

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

°F = 9/5 °C + 32

1 gal (H_2O) ≈ 8 lbm

°C = 5/9 (°F - 32)

c_p = 1.0 BTU/hr/lbm/°F

c_p = 1 cal/sec/gm/°C

A.1. a b c d ___

A.2. a b c d ___

A.3. a b c d ___

A.4. a b c d ___

A.5. a b c d ___

A.6.

1. a b c d ___

2. a b c d ___

3. a b c d ___

A.7. a b c d ___

A.8. a b c d ___

A.9. a b c d ___

A.10. a b c d ___

A.11. a b c d ___

A.12. a b c d ___

A.13. a b c d ___

A.14. a b c d ___

A.15. a b c d ___

A.16. a b c d ___

A.17. a b c d ___

A.18. a b c d ___

A.19. a b c d ___

A.20. a b c d ___

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

B.1. a b c d ___

B.2. a b c d ___

B.3. a b c d ___

B.4. a b c d ___

B.5.

1. a b c d e f g h ___

2. a b c d e f g h ___

3. a b c d e f g h ___

4. a b c d e f g h ___

5. a b c d e f g h ___

6. a b c d e f g h ___

7. a b c d e f g h ___

8. a b c d e f g h ___

B.6. a b c d ___

B.7. a b c d ___

B.8. a b c d ___

B.9. a b c d ___

B.10. a b c d ___

B.11. a b c d ___

B.12. a b c d ___

B.13. a b c d ___

B.14. a b c d ___

B.15. a b c d ___

B.16. a b c d ___

B.17. a b c d ___

B.18. a b c d ___

B.19. a b c d ___

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

C.1.	a	b	c	d	___	C.11.	a	b	c	d	___
C.2.	a	b	c	d	___	C.12.	a	b	c	d	___
C.3.	a	b	c	d	___	C.13.	a	b	c	d	___
C.4.	a	b	c	d	___	C.14.	a	b	c	d	___
C.5.	a	b	c	d	___	C.15.	a	b	c	d	___
C.6.	a	b	c	d	___	C.16.	a	b	c	d	___
C.7.	a	b	c	d	___	C.17.	a	b	c	d	___
C.8.	a	b	c	d	___	C.18.	a	b	c	d	___
C.9.	a	b	c	d	___	C.19.	a	b	c	d	___
C.10.	a	b	c	d	___	C.20.	a	b	c	d	___

(*** End of Section C ***)

*QUESTION (A.1) [1.0]
Which ONE of the following is the principle advantage of heavy water moderation as compared to light water moderation?

a. A lower mass number.

b. A lower absorption cross section.

c. A higher scattering cross section.

d. A lower density.

*QUESTION (A.2) [1.0]
For a reactor that has a multiplication factor equal to 0.75 and a neutron source emitting 1000 neutrons per second, which one of the following is the equilibrium state neutron population rate?

a. 1333 neutrons per second

b. 4000 neutrons per second

c. 5000 neutrons per second

d. 7500 neutrons per second

*QUESTION (A.3) [1.0]
Which one of the following describes the term "Prompt Critical?"

a. The reactor prompt fuel temperature coefficient is compensating reactivity to sustain critical conditions without delayed neutrons.

b. The reactor is producing enough or more than enough delayed neutrons to sustain critical conditions without prompt neutrons.

c. The reactor is producing enough or more than enough prompt neutrons to sustain critical without delayed neutrons.

d. The reactor instantaneously increases in power due to a rod withdrawal.

*QUESTION (A.4) [1.0]
For a reactor at 50 kilowatts, which one of the following is the time to reach 5.5 megawatts given a steady state reactor period of 20 seconds?

a. 47 seconds

b. 94 seconds

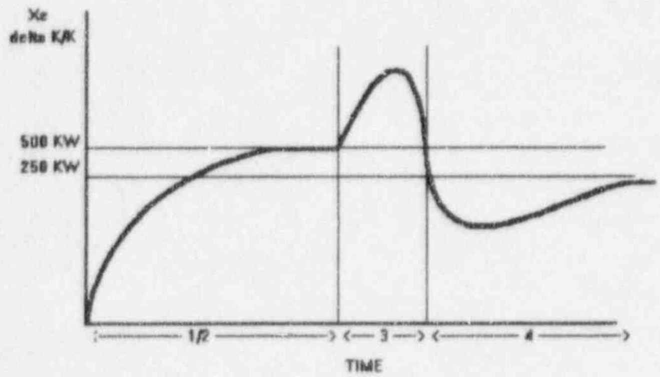
c. 110 seconds

d. 142 seconds

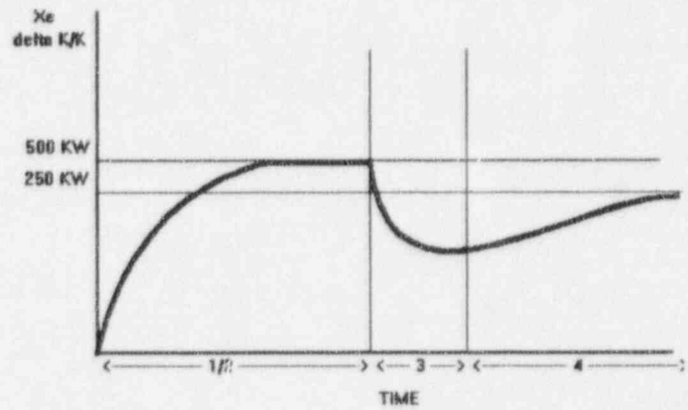
*QUESTION (A.5) [1.0]
Which one of the following figures most closely depicts the reactivity versus time plot for xenon for the following series of evolutions:

TIME	EVOLUTION
1	From clean core conditions, startup to 500 KW startup;
2	Operation at 500 KW for 65 hours;
3	Shutdown for 15 hours;
4	Startup to 250 Kw and steady state.

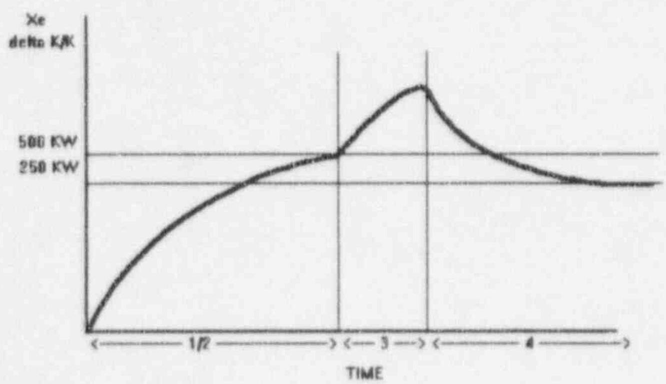
a.



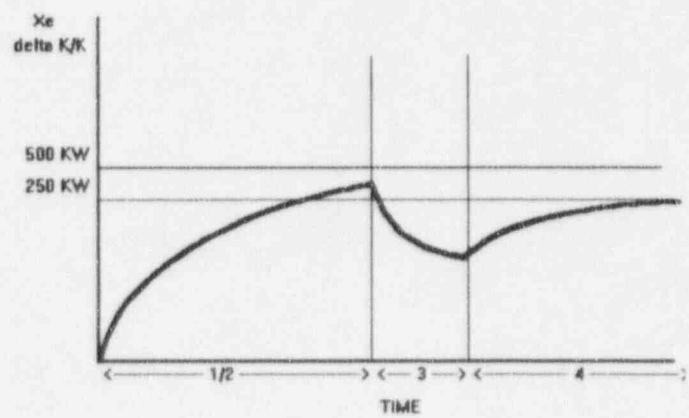
b.



c.



d.



*QUESTION (A.6) [1.0]
MATCH the appropriate reactivity and k_{eff} condition to the given reactor conditions. Note: Only one answer per reactor condition. Each reactivity and k_{eff} condition may be used more than once or not at all. Each correct answer is worth ⅓ of a point.

Reactivity and k_{eff} conditions:

a. $\rho<0$ and $k_{eff}>1.0$

b. $\rho=0$ and $k_{eff}=1.0$

c. $\rho<0$ and $k_{eff}<1.0$

d. $\rho>0$ and $k_{eff}>1.0$

Reactor conditions:

1. Subcritical _____

2. Critical _____

3. Supercritical _____

*QUESTION (A.7) [1.0]
Which ONE of the following are the design considerations for core excess reactivity at the Georgia Tech Research Reactor?

a. Fuel burnup, shim blade scram times, xenon override for a short period after shutdown, top reflector worth, and xenon and samarium poisons.

b. Shutdown margin, temperature changes, xenon override for a short period after shutdown, top reflector worth, void coefficient.

c. Shutdown margin, temperature changes, and regulating rod insertion and withdrawal rate, experiment absorption, and xenon and samarium poisons.

d. Fuel burnup, temperature changes, xenon override for a short period after shutdown, experiment absorption, and xenon and samarium poisons.

*QUESTION (A.8) [1.0]
Which one of the following statements describes the PRIMARY reason for installed neutron sources in reactor cores?

a. To provide a neutron level high enough to be monitored by nuclear instrumentation.

b. To increase the count rate by 1/M (M = Subcritical Multiplication Factor).

c. To provide neutrons to initiate the chain reaction.

d. To increase the equilibrium count rate by an amount equal to the source contribution.

*QUESTION (A.9) [1.0]
Which one of the following statements correctly describes the effect of delayed neutrons on a reactor.

a. The more delayed neutrons there are the more easily a reactor can be controlled.

b. The more delayed neutrons there are the less easily a reactor can be controlled.

c. Delayed neutrons have little effect on reactor design and safety analyses.

d. Delayed neutrons are only effective in reactor designs utilizing uranium 235 as the primary fissile material.

*QUESTION (A.10) [1.0]
Which one of the following is the MAJOR reason that reactor cores are generally designed with a negative moderator temperature coefficient?

a. For transients with increasing power, the associated increase in temperature with a negative moderator temperature coefficient would reduce k_{eff} and stop the power increase.

b. It is not possible to design a core with a positive moderator temperature coefficient.

c. A negative moderator temperature coefficient reduces power peaking in core designs simplifying core reload and accident analysis considerations.

d. A negative moderator temperature coefficient reduces the temperature variations through a core, thus reducing thermal and structural design requirements.

*QUESTION (A.11) [1.0]
Which one of the following is NOT correct about shutdown margin

The Technical Specification shutdown margin is calculated assuming:

a. Cooldown.

b. Xenon decay.

c. The regulating rod fully inserted.

d. The most reactive shim blade fully withdrawn.

*QUESTION (A.12) [1.0]
For a reactor at steady state power at a uniform moderator temperature of about 50°C, the fuel temperature reactivity coefficient is -1.0×10^{-5} ΔK/K/°C and the moderator temperature reactivity coefficient is -1.0×10^{-4} ΔK/K/°C. A regulating rod with a uniform rod worth of 0.05%ΔK/K/inch is withdrawn 2.0 inches. A moderator temperature rise of a uniform 5°C was measured. Which one of the following would be the uniform fuel temperature change immediately on reaching the new steady state power level?

a. decreased by about 5°C

b. increased by about 5°C

c. increased by about 50°C

d. increased by about 500°C

*QUESTION (A.13) [1.0]
Which one of the following is the bases for the safety limits in the forced convection mode to avoid gross fuel element failure and concomitant fission product release?

Limits are set at the values associated with:

a. Fuel clad melt.

b. Fuel meat melt.

c. Film boiling on the fuel clad.

d. Departure from nuclear boiling at the fuel clad.

*QUESTION (A.14) [1.0]
Which ONE of the following is <u>NOT</u> a characteristic of a good moderator?

a. A high scattering cross section.

b. A low mass number.

c. A low absorption cross section.

d. A low density.

*QUESTION (A.15) [1.0]
Which one of the following is the largest contributor to the energy from fission?

a. The kinetic energy of fission fragments.

b. The kinetic energy of fission neutrons.

c. Instantaneous fission gammas.

d. Antineutrinos.

*QUESTION (A.16) [1.0]
Which one of the following factors in the six-factor formula is most affected by control rod position?

a. Neutron reproduction factor.

b. Thermal utilization factor.

c. Resonance escape probability.

d. Fast fission factor.

*QUESTION (A.17) [1.0]
Given the following:

1. Primary flow......................1800 gallons per minute (gpm)
2. Average core inlet temperature......112 degrees Fahrenheit (°F)
3. Average core outlet temperature.....130 degrees Fahrenheit (°F)
4. Secondary flow....................1200 gpm
5. HX-D2 secondary inlet temperature....90 °F
6. HX-D1 secondary outlet temperature..120 °F
7. Specific heat for D_2O................0.162 kilowatts/gpm-°F
8. Specific heat for H_2O...............0.146 kilowatts/gpm-°F

Which one of the following is current reactor power?

a. 4.38 MW

b. 5.25 MW

c. 5.83 MW

d. 7.88 MW

*QUESTION (A.18) [1.0]
During a reactor startup, the FIRST reactivity coefficient to begin inserting negative reactivity into the core is:

a. The radiative heat transfer coefficient.

b. The void coefficient.

c. The moderator temperature coefficient.

d. The fuel temperature coefficient.

*QUESTION (A.19) [1.0]
Which one of the following would be the affect on measured control rod worth from recording the asymptotic reactor period too soon following rod movement?

a. Greater than actual rod worth due to shorter reactor period.

b. Less than actual rod worth due to longer reactor period.

c. Greater than actual rod worth due non-equilibrium core temperatures.

d. Less than actual rod worth due to non-equilibrium fuel temperatures.

*QUESTION (A.20) [1.0]
Which one of the following is the reason reactor power calibrations should NOT be performed at power levels less than 1 megawatt?

a. Coolant flow rates can not be accurately measured.

b. The delta temperature is too small to produce an accurate heat balance.

c. Rod shadowing causes nuclear instrumentation inaccuracies.

d. Variations in specific heat are too large.

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

*QUESTION (B.1) [1.0]
An unsecured experiment of 0.003 delta k/k worth will be inserted into a vertical experimental facility. Which one of the following is the MAXIMUM reactivity insertion rate that can be added by the experiment?

a. 0.0025 delta k/k-sec.

b. 0.004 delta k/k-sec.

c. 0.025 delta k/k-sec.

d. No limit.

*QUESTION (B.2) [1.0]
For a D_2O leak during operation at a power level of five (5) megawatts, the following actions are specified:

1. Connect city water or spent fuel pool water supply to the emergency core cooling systems, if level drops to less than 50 inches (otherwise go to next step).

2. The Emergency Director and the staff of the Neely Nuclear Research Center plan steps to assess the situation and return the facility to normal.

3. Scram the reactor and make sure the building is isolated.

4. Announce on the public address system that containment must be evacuated and leave by the fastest route possible.

Which one of the following is the order in which these actions are to be performed?

a. 2, 1, 3, and 4.

b. 2, 3, 1, and 4.

c. 3, 1, 2, and 4.

d. 3, 4, 1, and 2.

*QUESTION (B.3) [1.0]
The biomedical facility is to be used for boron neutron capture therapy (BNCT). The dose rate at one yard from the aperture is 500 rads/hr. Which one of the following is the expected MINIMUM Radiation Posting for the area during BNCT?

a. CAUTION, RADIOACTIVE MATERIAL or DANGER, RADIOACTIVE MATERIAL

b. CAUTION, RADIATION AREA or DANGER, RADIATION AREA

c. CAUTION, HIGH RADIATION AREA or DANGER, HIGH RADIATION AREA

d. GRAVE DANGER, VERY HIGH RADIATION AREA

*QUESTION (B.4) [1.0]
Which one of the following describes general operator and system response to a delayed scram annunciation alarm?

a. Observe applicable parameters, and initiate ABLE if conditions are not restored to normal and the automatic delayed scram has not occurred in the eight (8) second delay time.

b. Wait for the automatic delayed scram.

c. Observe applicable parameters, and initiate ABLE if conditions are not restored to normal and the automatic delayed scram has not occurred in the thirty (30) second delay time.

d. Observe applicable parameters, and initiate BAKER if conditions are not restored to normal and the automatic delayed scram has not occurred in the eight (8) second delay time.

*QUESTION (B.5) [2.0]
Match the radiological exposure limits to the applicable individual and type of exposure. NOTE: Some answers may be used more than once or not at all. Each correct answer is worth 0.25 points.

Radiological exposure limits:

a. 0.10 rem.

b. 0.50 rem.

c. 1.25 rem.

d. 5.0 rem.

e. 15.0 rem.

f. 50.0 rem.

g. 20 percent of regulatory limits.

h. 75 percent of regulatory limits.

Individual and type of exposure:

1. For a radiation worker, the total effective dose equivalent in a year. _____

2. For a radiation worker, the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the eye) in a year. _____

3. For a radiation worker, the dose to the eye in a year. _____

4. For a radiation worker, the shallow dose equivalent to the skin and extremities in a year. _____

5. Dose to a fetus. _____

6. For a minor radiation worker, the total effective dose equivalent in a year. _____

7. ALARA investigational limit. _____

8. For a member of the public, the total effective dose equivalent in a year. _____

*QUESTION (B.6) [1.0]
Which one of the following is the <u>MINIMUM</u> approval required for changes in a design described in the license and safety analysis report?

a. The Reactor Supervisor and the Manager of Reactor Operations.

b. The Reactor Supervisor and the Facility Director.

c. The Manager of Reactor Operations and the Facility Director.

d. The Facility Director and the Nuclear Safeguards Committee.

*QUESTION (B.7) [1.0]
The reactor has been at approximately three (3) megawatts for about eight (8) hours. The irradiated fuel storage pool water level is discovered at two feet below normal overflow. Which one of the following reactor control manipulations is the <u>MINIMUM</u> requirement in accordance with the Limiting Conditions for Operation of the Technical Specifications?

a. Isolate containment.

b. Reduce reactor power to 1 megawatt or less.

c. Secure the reactor.

d. Scram the reactor and isolate the containment.

*QUESTION (B.8) [1.0]
The reactor is operating in Mode 2 with two licensed Reactor Operators in the control room. The on shift Senior Reactor Operator (SRO) calls and indicates that (1) the SRO and all other Neely Nuclear Research Center personnel are evacuating the facility, and (2) the operators are to remain in the containment. Which one of the following is the <u>MINIMUM</u> action required by the Technical Specifications?

a. Isolate containment.

b. Reduce reactor power to 1 megawatt or less.

c. Secure the reactor.

d. Scram the reactor and isolate the containment.

*QUESTION (B.9) [1.0]
With the reactor in Mode 1, at 3:25 pm the observing operator was relieved by an unlicensed GTRR student and exited the containment. Which one of the following is the time when the reactor is required to be shutdown if a licensed operator has not returned to the control room?

a. 3:40 pm

b. 3:45 pm

c. 3:50 pm

d. 3:55 pm

*QUESTION (B.10) [1.0]
With the reactor operating in Mode 2 at 10:15 pm, the on shift Senior Reactor Operator informs you that he needs emergency medical assistance, and that you are the Emergency Director. Which one of the following do you do FIRST to get medical assistance.

a. Call the Facility Director.

b. Call the Grady Memorial Hospital.

c. Call the Georgia Tech Police Department.

d. Call the Atlanta Fire Department and Rescue Service.

*QUESTION (B.11) [1.0]
Which one of the following describes the MINIMUM requirements for an individual to tag equipment out of service?

a. Any person who uses the equipment.

b. Reactor operators.

c. Senior reactor operators.

d. The reactor supervisor.

*QUESTION (B.12) [1.0]
Which one of the following does NOT generally require a radiation work permit?

a. Entry into a Radiation Area.

b. Entry into an Airborne Radioactivity Area.

c. Modification of the biological shielding around the reactor.

d. Penetration of any port hole in the biological shield.

*QUESTION (B.13) [1.0]
For the movement of an experiment, which one of the following corresponds to the regulating rod motion (reactivity worth) above which the operator will shutdown the reactor?

a. 1 inch.

b. 2 inches.

c. 3 inches.

d. 5 degrees.

*QUESTION (B.14) [1.0]
A group of thirty-seven (37) high school science teachers has requested a tour of the reactor facility and radiation control zone. Which one of the following represents the MINIMUM number of escorts that will be required to escort these visitors?

a. One (1) escort.

b. Two (2) escorts.

c. Three (3) escorts.

d. Four (4) escorts.

*QUESTION (B.15) [1.0]
Which one of the following conditions by itself is a violation of a Technical Specification Safety Limit while in MODE 2 OPERATION?

a. Reactor power level is 5.5 megawatts.

b. Primary D_2O System flow is 1000 gpm.

c. Reactor Vessel D_2O level is 21 inches above the core.

d. Reactor coolant inlet temperature is 125 degrees F.

*QUESTION (B.16) [1.0]
While working with a new experiment that contains a large amount of radioactive liquid, a large leak of this liquid is discovered. Which one of the following is the FIRST action that should be taken?

a. Decontaminate personnel.

b. Attempt to isolate and contain the leak if possible.

c. Notify the Office of Radiation Safety.

d. Leave the area immediately.

~~*QUESTION (B.17) [1.0]~~
~~Which one of the following is a Reportable Occurrence, if discovered two (2) hours after an acceptable precritical startup checklist and shift supervisor approval at a reactor power level of two (2) megawatts?~~

~~a. The high thermal reactor power safety system trip setting was found to be 5.3 megawatts.~~

~~b. The duty SRO is made aware that the two Reactor D_2O flow rate channels low flow setpoints are at 1800 gallons per minute.~~

~~c. A unexpected reactivity change of 0.004 delta k/k.~~

~~d. Operating with a D_2O resistivity of 80,000 ohm cm.~~

*QUESTION (B.18) [1.0]
Which one of the following actions is a specified backup for the normal scram in the event that the reactor does not scram on demand?

a. Actuation of Emergency Cooling water to the core.

b. Stopping the Secondary H_2O System pump.

c. Draining the Top Reflector Control System.

d. Stopping the Primary D_2O System pump.

*QUESTION (B.19) [1.0]
Which one of the following operator reactor scrams would allow a reactor restart ONLY after approval from Neely Nuclear Research Center management?

a. Fire Alarm.

b. Severe Weather.

c. High H_2O Temperature.

d. Criticality Alarm.

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

*QUESTION (C.1) [1.0]
Which one of the following experimental facilities has the highest reactivity worth when flooded with D_2O?

a. H12, 6 inch lower tangent horizontal experimental facility.

b. H3, 4 inch horizontal experimental facility.

c. V24, 4 inch vertical experimental facility.

d. V27, 6 inch vertical experimental facility.

*QUESTION (C.2) [1.0]
Which one of the following describes the Primary D_2O/Secondary H_2O heat exchanger design?

a. The D_2O tube side pressure is less than the H_2O shell side pressure to prevent release of H_3 to the H_2O system.

b. The D_2O tube side pressure is greater than the H_2O shell side pressure to prevent contamination of the D_2O system with H_2O.

c. The D_2O tube side pressure is equal to the H_2O shell side pressure to minimize leakage between the D_2O and H_2O systems.

d. The D_2O shell side pressure is less than the H_2O tube side pressure to prevent release of H_3 to the H_2O system.

*QUESTION (C.3) [1.0]
Which one of the following is the <u>PRIMARY</u> purpose of the gas recombiner system?

a. To maintain D_2 concentrations well below explosive levels.

b. To maintain O_2 concentrations low to reduce N-16 to as low as reasonably achievable (ALARA).

c. To minimize argon-41 concentrations.

d. To maintain tritium concentrations low for ALARA purposes.

*QUESTION (C.4) [1.0]
Which one of the following is the <u>PRIMARY</u> purpose of the reactor ventilation system holdup duct that is cast in the containment basement floor?

a. To allow time for decay of argon-41 before release from the containment.

b. To provide increased dilution for release from the containment.

c. To provide a volume to immerse the Geiger-Mueller type (GM) gas monitor for accurate counting.

d. To allow time for the GM gas monitor to respond before air passes from the containment.

*QUESTION (C.5) [1.0]
Which one of the following is the reason that reactor containment integrity is maintained for eight (8) hours after shut down from a power level greater than one (1) megawatt?

a. Because the fuel element temperature will not reach a temperature high enough to melt the clad should a loss-of-coolant accident (LOCA) occur after 8 hours.

b. Because containment integrity after a LOCA can only be ensured for eight hours.

c. Because argon-41 levels decay to acceptable effluent concentration values eight hours after operations at greater than one megawatt.

d. Because one containment building isolation channel can be bypassed for the eight hour period in accordance with Technical Specifications.

*QUESTION (C.6) [1.0]
Which one of the following is the <u>MAJOR</u> function of the thermal shield?

a. To reduce heating in the concrete portion of the biological shield from absorption of radiation.

b. To remove decay heat for eight hours after reactor shutdown.

c. To provide primary system cooling during mode 2 operations.

d. To reduce heating cycle variations in the steel portion of the biological shield to minimize thermal fatigue.

*QUESTION (C.7) [1.0]
Which one of the following two electronic scram signals go to both Trip Logic Units, thus providing a "fast" scram signal to all four shim blades?

a. D_2O temperature and flow scram signals.

b. Period and D_2O flow scram signals.

c. Power and period scram signals.

d. D_2O flow and level scram signals.

*QUESTION (C.8) [1.0]
Which one of the following provides the general criteria for establishing the cooldown required from operation of the secondary coolant system?

a. The D_2O inlet temperature is at 123 degrees Fahrenheit.

b. The D_2O inlet temperature is at 114 degrees Fahrenheit.

c. The temperature of all connecting systems are near room temperature.

d. The temperature of all connecting systems are near 39 degrees Fahrenheit.

*QUESTION (C.9) [1.0]
Which one of the following provides makeup water for the fuel storage pool?

a. The liquid waste system pumps through deionizers and filters from the liquid waste tanks.

b. City water from reverse flow from the emergency core cooling system.

c. A conventional hose connection along the east wall of the hot equipment room.

d. The deionized water system.

*QUESTION (C.10) [1.0]
Which one of the following design features can open and reseal the containment airlocks after loss of supply air, and a loss of power resulting in a containment isolation?

a. Air accumulators.

b. Containment isolation reset buttons.

c. The reset buttons for the Kanne, gas, filter assembly, particulate and D_2O leak monitors.

d. The containment airlock interlock override switch.

*QUESTION (C.11) [1.0]
Which one of the following design features can change the position of the containment air inlet and exhaust isolation valves after loss of normal motive force?

a. The emergency power generator with capacity to operate motor driven containment isolation valves about 30 times after loss of electrical power.

b. The emergency batteries with capacity to operate solenoid valves about 100 times after loss of electrical power.

c. Air reservoirs with capacity to operate the containment isolation valves about 30 times after loss of normal building air.

d. Fast transfer to uninterruptable power supply.

*QUESTION (C.12) [1.0]
Which one of the following is NOT a penetration of the reactor vessel lower head (bottom)?

a. The overpressure relief duct.

b. The regulating rod drive shaft guide tube.

c. The moderator overflow and drain lines.

d. The D_2O inlet and outlet pipes.

*QUESTION (C.13) [1.0]
Which one of the following is NOT a containment isolation feature?

a. Liquid loop seals.

b. Automatic quick closing valves.

c. Inflatable gaskets.

d. Nitrogen accumulators.

*QUESTION (C.14) [1.0]
Which one of the following limits the maximum rate of reactivity change for the regulating rod?

a. The shutdown margin

b. The 10 degree limit on rod position.

c. The selsyn pair.

d. Rod speed.

*QUESTION (C.15) [1.0]
For the following nuclear instrumentation channels,

1. A count rate meter channel,

2. Two power level trip channels,

3. Two log-N and period amplifier channels, and

4. Two micro-micro (pico) ammeter channels;

which one of the following provides the order in which they begin indicating or become operative for routine increasing power conditions?

a. 4, 1, 2, and 3.

b. 1, 4, 3, and 2.

c. 1, 3, 4, and 2.

d. 4, 1, 3, and 2.

*QUESTION (C.16) [1.0]
Which one of the following provides nuclear power input for the automatic power control system?

a. A count rate meter channel.

b. Two power level trip channels.

c. Two log-N and period amplifier channels.

d. Two micro-micro (pico) ammeter channels.

*QUESTION (C.17) [1.0]
Which one of the following describes the functions of the scram and shutdown buttons?

a. The scram and the shutdown buttons remove electrical power to the entire shim safety blade circuit.

b. The scram and the shutdown buttons remove power to the shim safety blade magnets.

c. The scram button removes electrical power to the entire shim safety blade circuit and the shutdown button removes power to the shim safety blade magnets.

d. The scram button removes electrical power to the shim safety blade magnets and the shutdown button removes power to the entire shim safety blade circuit.

*QUESTION (C.18) [1.0]
Which one of the following instrument components DIRECTLY generate an emergency core cooling system, "ECCS," annunciator alarm?

a. The reactor tank pressure switch.

b. The loss of electrical power relay.

c. The ECCS spray block valve closed limit switch.

d. The reactor tank low level switch.

*QUESTION (C.19) [1.0]
Which one of the following is the reason that no more than four unirradiated fuel elements shall be together in any one room outside the reactor, shipping containers or fuel storage racks?

a. The calculated k_{eff} is less than 0.85.

b. Calculations show that criticality can not be achieved.

c. The Uranium 235 content is below the quantity allowed by the security plan.

d. Uranium 233 and 235, and plutonium concentration is the below formula quantity limit.

*QUESTION (C.20) [1.0]
Which one of the following is a delayed scram?

a. High D_2O temperature.

b. High H_2O temperature.

c. High building radiation.

d. High D_2O Conductivity before ion exchanger.

(*** End of Section C ***)

*ANSWER (A.1)
b

*REFERENCE (A.1)
GIT Reactor Theory pages. 9-8 and 9-18.

*ANSWER (A.2)
b

*REFERENCE (A.2)
Georgia Tech. Reactor Theory, Chapt. 10, page 10-35
SCR = $S/(1-K_{eff})$ = 1000cps/(1-0.75) = 4000cps

*ANSWER (A.3)
c

*REFERENCE (A.3)
GIT Reactor Theory pgs. 10-48

*ANSWER (A.4)
b

*REFERENCE (A.5)
1. "Reactor Theory", pages 10-36 to 10-42.

2. P(1) = P(0)e (t/period)
5500 = 50 * e [t/20 sec]
5500/50 = e [t/20]
ln (110) = t/20
t = 20*4.7 = 94 seconds

*ANSWER (A.5)
a

*REFERENCE (A.5)
Georgia Tech. Reactor Theory, Chapt. 10, pages 10-77 through 79.

*ANSWER (A.6)
Reactor condition:

1. Subcritical __c__

2. Critical __b__

3. Supercritical __d__

*REFERENCE (A.6)
GIT Reactor Theory pg. 10-22

*ANSWER (A.7)
d

*REFERENCE (A.7)
SAR, Section 4.4.10.9, "Reactivity Requirements," page 102.

*ANSWER (A.8)
a.

*REFERENCE (A.8)
GIT Reactor Theory pg. 10-28

*ANSWER (A.9)
a

*REFERENCE (A.9)
GIT Reactor Theory pg. 8-15

*ANSWER (A.10)
a

*REFERENCE (A.10)
1. "Reactor Theory", pages 10-58.

*ANSWER (A.11)
c

*REFERENCE (A.11)
1. Technical Specification 3.1.a, "Reactivity Limits", page 9.

*ANSWER (A.12)
c

*REFERENCE (A.12)
Georgia Tech. Reactor Theory, Chapt. 10, pages 10-55 through 10-73 (Reactivity Coefficients) and pages 10-22 through 10-27 (Control Rods).

Control rod reactivity = $+(0.0005\ \Delta k/k/\text{inch})(2\ \text{inches})$
$= +0.001\Delta k/k$.
Moderator reactivity = $(-1.0 \times 10^{-4}\Delta K/K/°C)(5°C)$
$= -0.0005\Delta k/k$
For critical reactor,
0 = Control rod reactivity + Moderator reactivity + Fuel reactivity, or
Fuel reactivity = -(Control rod reactivity + Moderator reactivity)
$= -(0.001\ \Delta k/k - 0.0005\Delta k/k) = -0.0005\Delta k/k$
Fuel temperature change = Fuel reactivity/fuel temperature coefficient
Fuel temperature change = $(-0.0005\Delta k/k)/(-1.0 \times 10^{-5}\ \Delta k/k/°C) = 50°C$.

*ANSWER (A.13)
d

*REFERENCE (A.13)
Technical Specifications 2.1.1, "Safety Limits In The Forced Convection Mode", page 6.

*ANSWER (A.14)
d
*REFERENCE (A.14)
GIT Reactor Theory pages. 9-6 through 9-8.

*ANSWER (A.15)
a

*REFERENCE (A.15)
GIT Reactor Theory pg. 8-8.

*ANSWER (A.16)
b

*REFERENCE (A.16)
Georgia Tech. Reactor Theory, Chapt. 10, page 10-8

*ANSWER (A.17)
b

*REFERENCE (A.17)
1. Procedure 2015, "Reactor Power Calibration", page 4.

2. P (kw) = F*C*(To-Ti)
P = (1200 gpm)*(.146)*(120-90) = 5250 kw or
P = (1800 gpm)*(.162)*(130-112) = 5250 kw

*ANSWER (A.18)
d

*REFERENCE (A.18)
GIT Reactor Theory pg. 10-71

*ANSWER (A.19)
a

*REFERENCE (A.19)
1. Procedure 7246, "Control Element Reactivity Worth Measurement", page 1 of 3.

*ANSWER (A.20)
* b

*REFERENCE (A.20)
1. Procedure 2015. "Reactor Power Calibration", page 2 of 4.

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

*ANSWER (B.1)
a

*REFERENCE (B.1)
Technical Specification 3.4, "Limitations Of Experiments", page 17.

*ANSWER (B.2)
d

*REFERENCE (B.2)
Procedure 6020, "Response to Heavy Water Leakage in the Containment Building," Sections 5.2.3, page 3.

*ANSWER (B.3)
~~d~~c Answer changed per facility comment

*REFERENCE (B.3)
1. 10CFR20.1003 and 10CFR20.1902.
2. Procedure 9310, "Posting of Radiological Control Areas and Materials," pages 3-5.

*ANSWER (B.4)
a

*REFERENCE (B.4)
1. Procedure 2601, "Response to a Reactor Scram Initiated by a Safety System," pages 5 through 7.

*ANSWER (B.5)
1. d; 2. f 3. e 4. f 5. b 6. b 7. g
8. a
*REFERENCE (B.5)
1. 10CFR20.1201, 20.1207, 20.1208, and 20.1301.
2. Radiation Safety Manual, Section V, "ALARA," page 8, and Section VI, "Permissible Exposure Limits for Personnel," pages 9 and 10.

*ANSWER (B.6)
d

*REFERENCE (B.6)
1. Procedure 4200, "Changes to GTRR Design," page 2.

*ANSWER (B.7)
b

*REFERENCE (B.7)
1. Technical Specifications 3.7.c

*ANSWER (B.8)
c

*REFERENCE (B.8)
1. Technical Specifications 6.1.d-Need SRO in facility

*ANSWER (B.9)
c

*REFERENCE (B.9)
1. Procedure 2001. "Two Operator Operation". page 3.

*ANSWER (B.10)
c

*REFERENCE (B.10)
1. Procedures 6010. "General Rules and Guides for Handling Emergencies." page 3.
2. Procedures 6100. "Emergency Notification." page 4.

*ANSWER (B.11)
~~a~~a or b Answer added per facility comment

*REFERENCE (B.11)
1. Procedure 4950. "Tagging Equipment Out Of Service". page 1.

*ANSWER (B.12)
a

*REFERENCE (B.12)
1. Procedure 9306. "Preparation and Maintenance of Radiation Work Permits (RWPs)". page 2.

*ANSWER (B.13)
b

*REFERENCE (B.13)
1. Procedure 3103. "Operation of Experimental Facilities." page 3.
2. Procedure 3104. "Pneumatic Tub Transport System." page 1.

*ANSWER (B.14)
c

*REFERENCE (B.14)
1. Procedure 0001. "Access Control and Accountability of Keys and Access Cards." page 5. There is a limit of fifteen (15) individuals that can be escorted by one authorized escort into the facility.

*ANSWER (B.15)
d

*REFERENCE (B.15)
1. Technical Specification 2.1, "Safety Limits", page 6.
2. Safety Analysis Report, page 78.

*ANSWER (B.16)
b

*REFERENCE (B.16)
1. Procedure 9303, "Guidelines For Handling Radioactive Spills", pages 2 and 3.

*ANSWER (B.17)
~~b~~ deleted per facility comment

*REFERENCE (B.17)
1. Technical Specifications 1.0, "Definitions", page 2.
2. Technical Specification 2.2.1, "Limiting Safety System Settings in the Force Convection Mode," page 7.
3. Technical Specification 3.6, "Primary Coolant System", page 23.
4. Technical Specification 4.2.a, "Surveillance Requirements for Reactor Control And Safety Systems," Table 4.1, page 30.

*ANSWER (B.18)
c

*REFERENCE (B.18)
1. SAR, 4.4.9.3, "Top Reflector Control System", page 83.

*ANSWER (B.19)
c

*REFERENCE (B.19)
1. Procedure 2020, "Reactor Restart After Scram", page 2 of 4.

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

*ANSWER (C.1)
a

*REFERENCE (C.1)
1. SAR, 4.4.10.7, "Reactivity Worth of Experimental Facilities," page 100.

*ANSWER (C.2)
b

*REFERENCE (C.2)
1. SAR, 4.4.8.1, "Primary D_2O System," Pg. 78.

*ANSWER (C.3)
a

*REFERENCE (C.3)
1. SAR, Section 4.4.9.4, "Recombiner System," page 84.
2. TS 3.6.e, "Primary Coolant System," pages 23-4.

*ANSWER (C.4)
d

*REFERENCE (C.4)
1. SAR, 4.5.1, "Facility Monitoring," page 106.

*ANSWER (C.5)
a

*REFERENCE (C.5)
1. TS 3.3, "Containment Building", pages 14-6.

*ANSWER (C.6)
a

*REFERENCE (C.6)
SAR, 4.4.5, "Biological Shield", page 55.

*ANSWER (C.7)
c

*REFERENCE (C.7)
1. SAR, 4.4.7.2, "Reactor Safety Interlock System," page 67.

*ANSWER (C.8)
c

*REFERENCE (C.8)
Proc. 2200, "Secondary Coolant System-Operation," page 1.

*ANSWER (C.9)
c

*REFERENCE (C.9)
1. SAR, 4.2.4, "Liquid Waste Handling," page 30.

*ANSWER (C.10)
a

*REFERENCE (C.10)
1. Georgia Tech P&ID, 045-60-001
2. SAR, Section 4.4.7.1 and 4.4.7.2, Pg. 66 and 67.
3. 6/94 Exam

*ANSWER (C.11)
c

*REFERENCE (C.11)
SAR, 4.3.2, "Provisions for Insuring Leak Tightness," page 41.

*ANSWER (C.12)
b

*REFERENCE (C.12)
SAR, 4.4.2, "Reactor Vessel," page 48.

*ANSWER (C.13)
d

*REFERENCE (C.13)
1. SAR, Table 4.1, "GTTR Containment Building Penetrations of Inserts," page 39.

*ANSWER (C.14)
d

*REFERENCE (C.14)
1. SAR, 4.4.4, "Control Elements Drive," page 52.

*ANSWER (C.15)
b

*REFERENCE (C.15)
1. SAR, 4.4.7.1, "Nuclear Instrumentation," page 66.

*ANSWER (C.16)
d

*REFERENCE (C.16)
1. SAR, 4.4.7.1, "Nuclear Instrumentation," page 66.

*ANSWER (C.17)
c

*REFERENCE (C.17)
1. Procedure 2601, "Response to Reactor Scram Initiated by a Safety System," section 5.1.2.1, page 2.

*ANSWER (C.18)
c

*REFERENCE (C.18)
1. Miscellaneous folder on alarm annunciators.

*ANSWER (C.19)
b

*REFERENCE (C.19)
1. Technical Specification 3.8.b, Basis.

*ANSWER (C.20)
b

*REFERENCE (C.20)
1. SAR, Table 4.3, "GTRR Safety Interlock System," pages 71-4.

(*** End of Section C ***)

A.1 b

A.2 b

A.3 c

A.4 b

A.5 a

A.6 Reactor condition:

1. Subcritical __c__

2. Critical __b__

3. Supercritical __d__

A.7 d

A.8 a

A.9 a

A.10 a

A.11 c

A.12 c

A.13 d

A.14 d

A.15 a

A.16 b

A.17 b

A.18 d

A.19 a

A.20 b

B.1 a

B.2 d

B.3 ~~d~~c Answer changed per facility comment

B.4 a

B.5 1. d; 2. f 3. e 4. f 5. b 6. b 7. g
8. a

B.6 d

B.7 b

B.8 c

B.9 c

B.10 c

B.11 ~~a~~a or b Answer added per facility comment

B.12 a

B.13 b

B.14 c

B.15 d

B.16 b

B.17 ~~b~~ deleted per facility comment

B.18 c

B.19 c

C.1 a

C.2 b

C.3 a

C.4 d

C.5 a

C.6 a

C.7 c

C.8 c

C.9 c

C.10 a

C.11 c

C.12 b

C.13 d

C.14 d

C.15 b

C.16 d

C.17 c

C.18 c

C.19 b

C.20 b

DOCUMENT NAME: P:\NONPOWR\KARAM.INR

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-160/OL-95-01

	NAME	DATE
1.	Marvin Mendonca	
2.	SWEISS	
3.	SECRETARY (dispatch)	

CAN THIS DOCUMENT BE DELETED? YES__X__ NO______

January 17, 1996

Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
Atlanta, Georgia 30332

Dear Dr. Karam:

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-160/OL-95-01

During the weeks of November 13, 1995 and December 11, 1995, the NRC administered an initial examination to employees of your facility who had applied for a license to operate your Georgia Institute of Technology Research Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. At the conclusion of the operating tests and the written examination, exit meetings were held with those members of the Georgia Institute of Technology Research Reactor staff identified in the enclosed report.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the attachments will be placed in the NRC Public Document Room.

Should you have any questions concerning this examination, please contact Mr. Marvin M. Mendonca of my staff at (301) 415-1128.

Sincerely,

Original signed by:

Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-160

Attachments:
1. Initial Examination Report No. 50-160/OL-95-01
2. Facility comments and NRC resolution of comments
3. Examination and answer key

cc w/attachments:
See next page

DISTRIBUTION w/ attachments:
PUBLIC
EMcAlpine, RII
MMendonca, PM
Facility File (DMcCain)
Docket Files No. 50-160

DISTRIBUTION w/o attachments:
PDND r/f
BGrimes
DCrutchfield
Document Control
LTremper, LFDCB (T-9 E-10)
EHylton

PDND:LA	HOLB:DRCH	PDND:PM	PDND:D
EHylton	DMcCain	MMendonca	SWeiss
12/26/95	1/16/96	12/29/95	1/17/96

OFFICIAL RECORD COPY
DOCUMENT NAME: G:\SECY\MENDONCA\KARAM