February 23, 2001

Mr. Edward Ehrlich
Nuclear Test Reactor Manager
General Electric Company
Vallecitos Nuclear Center
Sunol, CA 94586

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-073/OL-01-01

Dear Mr. Ehrlich:

During the week of January 1, 2001, the NRC administered initial examinations to an employee of your facility who had applied for a license to operate your General Electric Test 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 2.790 of the Commission's regulations, a copy of this letter and the enclosures will 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/index.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/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-073

Enclosures: 1. Initial Examination Report No. 50-073/OL-01-01
2. Examination and answer key

cc w/encls:

Please see next page

cc:

Mr. Steve Hsu
Radiologic Health Branch
State Department of Health Service
P.O. Box 942732
Sacramento, CA 94234-7320

California Department of Health
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Radiological Health Section
714 P Street, Room 498
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Mr. Chuck Bassett, Manager
Regulatory Compliance
Vallecitos Nuclear Center
General Electric Company
P.O. Box 460
Pleasanton, CA 94566

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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cc w/encls:
Please see next page

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Facility File (EBarnhill) (O6-D17)

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REXB r/f
WEresian
LMarsh

ADAMS ACCESSION #: ML010390496 **TEMPLATE #: NRR-074**

OFFICE	DIPM:IOLB		REXB:CE		REXB:BC	
NAME	EBarnhill		WEresian		LMarsh	
DATE	02/ 16 /2001		02/ 12 /2001		02/ 22 /2001	

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

REPORT NO.:	50-073/OL-01-01
FACILITY DOCKET NO.:	50-073
FACILITY LICENSE NO.:	R-33
FACILITY:	General Electric - Vallecitos Nuclear Center
EXAMINATION DATES:	January 18-19, 2001
EXAMINER:	Warren Eresian, Chief Examiner

SUBMITTED BY: ***/RA/*** 02/ 12 /2001

Warren Eresian, Chief Examiner Date

SUMMARY:

During the week of January 15, 2001, the NRC administered an operator licensing examination to one Reactor Operator candidate. The candidate passed the operating test but failed Category A of the written examination.

REPORT DETAILS

1. Examiner: Warren Eresian, Chief Examiner

2. Results:

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

3. Exit Meeting:

Mr. Chuck Bassett, Manager Regulatory Compliance
Mr. Dennis Smith
Mr. William Kreutel
Warren Eresian, NRC Chief Examiner

The NRC thanked the facility staff for their cooperation during the examination. The facility provided comments on the written examination. As a result of their comments, the following questions were deleted:

Category A

Question 19: Delete, no correct answer.

Category C

Question 01: Delete, no correct answer.

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

FACILITY: General Electric

REACTOR TYPE: Test Reactor

DATE ADMINISTERED: 01/18/01

REGION: 4

CANDIDATE:_____

INSTRUCTIONS TO CANDIDATE:

Answers are to be written on the exam page itself, or the answer sheet provided. Write answers one side ONLY. Attach any answer sheets to the examination. Points for each question are indicated in parentheses for each question. A 70% in each category 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
19	34	_____	____	A. REACTOR THEORY, THERMODYNAMICS, AND FACILITY OPERATING CHARACTERISTICS
20	34	_____	____	B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
17	32	_____	____	C. FACILITY AND RADIATION MONITORING SYSTEMS
56		_____% FINAL GRADE		

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 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. The point value for each question is indicated in parentheses after the question.

8. 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.

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

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

11. 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)

A reactor is subcritical with a K_{eff} of 0.955. Seven dollars ($7.00) of positive reactivity is inserted into the core ($\beta = 0.007$). At this point, the reactor is:

a. subcritical.

b. exactly critical.

c. supercritical.

d. prompt critical.

QUESTION: 002 (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 rod 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

QUESTION: 003 (1.00)

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

a. increases as neutron energy increases.

b. decreases as neutron energy increases.

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

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

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

QUESTION: 004 (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: 005 (1.00)

During a reactor startup, the count rate is increasing linearly with time, with no rod motion. This means that:

a. the reactor is subcritical and the count rate increase is due to the buildup of delayed neutron precursors.

b. the reactor is critical and the count rate increase is due to source neutrons.

c. the reactor is subcritical and the count rate increase is due to source neutrons.

d. the reactor is critical and the count rate increase is due to the buildup of delayed neutron precursors.

QUESTION: 006 (1.00)

A 1/M curve is being generated as fuel is loaded into the core. After some fuel elements have been loaded, the count rate existing at that time is taken to be the new initial count rate, C_o. Additional elements are then loaded and the inverse count rate ratio continues to decrease. As a result of changing the initial count rate:

a. criticality will occur with the same number of elements loaded as if there were no change in the initial count rate.

b. criticality will occur earlier (i.e., with fewer elements loaded.)

c. criticality will occur later (i.e., with more elements loaded.)

d. criticality will be completely unpredictable.

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

QUESTION: 007 (1.00)

Which ONE of the following statements describes Xenon behavior?

a. Following a xenon-free startup to 100% power, xenon reaches equilibrium after about 11 hours of operation.

b. Xenon production and removal varies linearly with power, so the value of equilibrium xenon at 100% power is twice that at 50% power.

c. At equilibrium conditions, the decay of xenon is the major removal method.

d. Xenon is produced directly from fission and from the decay of Iodine-135.

QUESTION: 008 (1.00)

For a beta effective = 0.0074, a reactivity insertion of 20 cents corresponds approximately to:

a. 0.0010 delta k/k.

b. 0.0015 delta k/k.

c. 0.0020 delta k/k.

d. 0.0074 delta k/k.

QUESTION: 009 (1.00)

During the minutes following a reactor scram, reactor power decreases on a negative 80 second period, corresponding to the half-life of the longest lived delayed neutron precursor, which is approximately:

a. 20 seconds.

b. 40 seconds.

c. 55 seconds.

d. 80 seconds.

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

QUESTION: 010 (1.00)

The fuel-to-moderator ratio describes the relationship between the number of fuel atoms in a volume of core to the number of moderator atoms. A reactor which is:

a. undermoderated will have a positive moderator temperature coefficient.

b. undermoderated will have a negative moderator temperature coefficient.

c. overmoderated will have a constant moderator temperature coefficient.

d. overmoderated will have a negative moderator temperature coefficient.

QUESTION: 011 (1.00)

Which ONE statement below describes a positive temperature coefficient?

a. When temperature increases, positive reactivity is added.

b. When temperature decreases, positive reactivity is added.

c. When temperature increases, negative reactivity is added.

d. When temperature increases, reactor power decreases.

QUESTION: 012 (1.00)

A reactor with an initial population of $1x10^8$ 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 $\beta = 0.007$.

a. 700.

b. 7,000.

c. 99,300.

d. 100,000.

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

QUESTION: 013 (1.00)

Inelastic scattering can be described as a process whereby a neutron collides with a nucleus and:

a. reappears with a lower kinetic energy, with the nucleus emitting a gamma ray.

b. reappears with the same kinetic energy it had prior to the collision.

c. is absorbed by the nucleus, with the nucleus emitting a gamma ray.

d. reappears with a higher kinetic energy, with the nucleus absorbing a gamma ray.

QUESTION: 014 (1.00)

Two different neutron sources are used during two reactor startups. The source used in the first startup emits ten times as many neutrons as the source used in the second startup. Assume all other factors are the same for the two startups. Which ONE of the following describes 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 the rods being further out of the core.

d. The second startup will result in the rods being further out of the core.

QUESTION: 015 (1.00)

The infinite neutron multiplication factor K-infinite differs from K-effective in that K-effective takes into account:

a. leakage from the core.

b. neutrons from fast fission.

c. the effect of poisons.

d. delayed neutrons.

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

QUESTION: 016 (1.00)

Which ONE of the following describes the response of the subcritical reactor to equal insertions of positive reactivity as the reactor approaches critical? Each reactivity insertion causes:

a. a SMALLER increase in the neutron flux, resulting in a LONGER time to reach equilibrium.

b. a SMALLER increase in the neutron flux, resulting in a SHORTER time to reach equilibrium.

c. a LARGER increase in the neutron flux, resulting in a LONGER time to reach equilibrium.

d. a LARGER increase in the neutron flux, resulting in a SHORTER time to reach equilibrium.

QUESTION: 017 (1.00)

For the same constant reactor period, which ONE of the following transients requires the longest time to occur?
A power increase of:

a. 5% of rated power - going from 1% to 6% of rated power.

b. 10% of rated power - going from 10% to 20% of rated power.

c. 15% of rated power - going from 10% to 25% of rated power.

d. 20% of rated power - going from 15% to 35% of rated power.

QUESTION: 018 (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 factors 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.

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

QUESTION: 019 (1.00) DELETED

The moderator temperature coefficient of reactivity is -1.25×10^{-5} 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 moderator temperature has:

a. increased by 8 deg C.

b. decreased by 8 deg C.

c. increased by 0.8 deg C.

d. decreased by 0.8 deg C.

QUESTION: 020 (1.00)

The effective neutron multiplication factor, K_{eff}, is defined as:

a. absorption/(production + leakage)

b. (production + leakage)/absorption

c. (absorption + leakage)/production

d. production/(absorption + leakage)

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

QUESTION: 001 (1.00)

There is indication by the stack gas or particulate monitor that radioactive effluent release rate exceeded the alarm setpoint by a factor of 1000 to 2000 for a period > 10 minutes. In accordance with the Radiological Emergency Plan, this event would be classified as a(n):

a. Unusual Event.

b. Alert.

c. Site Area Emergency.

d. General Emergency.

QUESTION: 002 (1.00)

With regard to visitors, which ONE of the following statements is true:

a. A visitor who is under continuous escort by a VNC employee and who will not enter a posted radiation area does not need a film badge or dosimeter.

b. A short-term visitor (only there for one day) does not require a Radiation Work Permit to work in a posted radiation area.

c. Any General Electric Company employee is classified as a VNC employee for visitor control purposes.

d. An extended visitor is a person having access to VNC for two or more consecutive days.

QUESTION: 003 (1.00)

Two centimeters of lead placed in a beam of gamma rays reduces the radiation level from 400 mR/hr to 200 mR/hr. Which ONE of the following is the <u>total</u> thickness of lead that would reduce the gamma radiation level from 400 mR/hr to 50 mR/hr.?

a. 4 cm.

b. 6 cm.

c. 7 cm.

d. 8 cm.

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

QUESTION: 004 (1.00)

The reactor is operating at full power over the weekend, during which time the Reactor Operator (RO) in the control room becomes ill and is taken to a hospital. Only a Senior Reactor Operator (SRO) and an operator trainee remain in the facility. In accordance with the Technical Specifications, reactor operations:

a. must be discontinued because both an RO and SRO must be present at the facility.

b. must be discontinued because there is only one licensed person at the facility.

c. may continue since the SRO can operate the facility with a second knowledgeable person available.

d. may continue until a replacement RO can arrive at the facility, up to a maximum of 30 minutes.

QUESTION: 005 (1.00)

During reactor operation, an abnormal reactivity change occurs which reduces reactor power to a lower steady state level. The reactor operator should:

a. hold the power at the lower level until the cause of the change can be determined.

b. return power to its original level if the cause of the change is known.

c. shut down the reactor.

d. gradually increase power to try to determine if the cause is repeatable.

QUESTION: 006 (1.00)

“The linear neutron power monitor channel scram setpoint shall not exceed the measured value of 125 kW.” This is an example of a:

a. safety limit.

b. limiting safety system setting.

c. limiting condition for operation.

d. surveillance requirement.

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

QUESTION: 007 (1.00)

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

a. 100 mrem/hr.

b. 60 mrem/hr.

c. 40 mrem/hr.

d. 160 mrem/hr.

QUESTION: 008 (1.00)

With regard to Radiation Work Permits (RWPs), which ONE of the following statements is NOT true?

a. The maximum duration of a RWP is seven consecutive days.

b. The RWP can be approved by any SRO or the Manager, NTR.

c. Any licensed RO or SRO may terminate an RWP.

d. No more than seven performing individuals may be used for a specific RWP.

QUESTION: 009 (1.00)

Which ONE of the following defines a “channel check?”

a. Combination of sensors, lines, amplifiers and output devices which are connected for the purpose of measuring the value of a parameter.

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

c. The introduction or interruption of a signal into the channel to verify that it is operable.

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

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

QUESTION: 010 (1.00)

A radiation survey of an area reveals a general radiation reading of 1 mrem/hr. There is, however, a small pipe which reads 10 mrem/hr at one (1) meter. Which ONE of the following defines the posting requirements for the area in accordance with 10CFR20?

a. Restricted Area.

b. Caution Radiation Area.

c. Caution High Radiation Area.

d. Grave Danger, Very High Radiation Area.

QUESTION: 011 (1.00)

In accordance with the Technical Specifications, which ONE of the following conditions is permissible when the reactor is operating, or about to be operated?

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

b. Average scram time of four safety rods = 300 msec.

c. Excess reactivity = $1.00.

d. Positive temperature coefficient of reactivity of primary coolant when primary coolant temperature = 120 degrees F.

QUESTION: 012 (1.00)

The maximum licensed power level for the GENTR is 100 kW. This means that:

a. at no time may reactor power exceed 100 kW.

b. the reactor must automatically scram when power exceeds 100 kW.

c. the steady state power level may not exceed 100 kW.

d. the steady state power level may not usually exceed 100 kW, but may be exceeded temporarily for a special experiment with permission from the Nuclear Safety Group.

QUESTION: 013 (1.00)

Which ONE of the following events does NOT require the presence of an SRO at the facility?

a. Recovery from an unscheduled shutdown.

b. Movement of reactor fuel.

c. An experiment change with a reactivity worth > $1.00.

d. Reactor power calibration.

QUESTION: 014 (1.00)

In accordance with 10 CFR 20, the “Derived Air Concentration (DAC)” refers to:

a. the amount of radioactive material taken into the body by inhalation or ingestion in one year which would result in a committed effective dose equivalent of five (5) rems.

b. the concentration of a given radionuclide in air which, if breathed for a working year of 2000 hours, would result in a committed effective dose equivalent of five (5) rems.

c. the dose equivalent to organs that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

d. the limits on the release of effluents to an unrestricted environment.

QUESTION: 015 (2.00)

Which ONE of the following provides the <u>minimum</u> personnel requirements for insertion or withdrawal of a manual poison sheet? The manipulation will be done by a _____ and a _____ will be in the control room observing the nuclear instrumentation.

a. licensed operator; senior licensed operator

b. licensed operator; licensed operator

c. knowledgeable person; licensed operator

d. knowledgeable person; senior licensed operator

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

QUESTION: 016 (1.00)

In accordance with the Technical Specifications, reactor operation shall not be permitted unless the core tank is filled with water. This limit is based on:

a. ensuring that there will be no reactivity insertions due to the sudden addition of water into the core tank.

b. providing adequate neutron and gamma shielding during operation.

c. providing sufficient suction head for the primary pump.

d. reducing the probability of aluminum corrosion.

QUESTION: 017 (2.00)

Match the 10 CFR Part 55 requirements listed in Column A for an actively licensed operator with the correct time period from Column B. Column B answers may be used once, more than once, or not at all.

	Column A	Column B	
a.	License Expiration	1.	1 year
b.	Medical Examination	2.	2 years
c.	Requalification Written Examination	3.	3 years
d.	Requalification Operating Test	4.	6 years

QUESTION: 018 (1.00)

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

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

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

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

d. Both readings are the same.

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

QUESTION: 019 (1.00)

In order to maintain an active reactor or senior reactor operator license, the license-holder must perform the functions of his/her position for at least:

a. four hours per calendar quarter.

b. three hours per calendar quarter.

c. one hour per month.

d. twenty hours per year.

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

QUESTION: 001 (1.00) DELETED

It is desired to perform a reactor startup, but to raise power to only 100 watts. For this situation:

a. the reactor cell must be at a negative pressure with respect to adjoining areas and the primary cooling system must be operating.

b. the primary cooling system must be operating.

c. the reactor cell must be at a negative pressure with respect to adjoining areas.

d. neither the primary cooling system must be operating nor the reactor cell must be at a negative pressure with respect to adjoining areas.

QUESTION: 002 (1.00)

Primary coolant flow is regulated by:

a. throttling valve TV-101.

b. varying the speed of the primary pump.

c. throttling valve TV-103.

d. throttling valve V-204.

QUESTION: 003 (1.00)

One of the three picoammeters indicates a “Downscale” alarm. As a result:

a. control rods and safety rods cannot be withdrawn.

b. control rods can be withdrawn, but safety rods cannot be withdrawn.

c. safety rods can be withdrawn, but control rods cannot be withdrawn.

d. both control rods and safety rods can be withdrawn.

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

QUESTION: 004 (1.00)

Which ONE of the following is NOT a process scram?

a. Primary coolant high core outlet temperature at 100% power.

b. Low primary coolant flow at 100% power.

c. Positive pressure in reactor cell with respect to adjoining areas at 100% power.

d. Log N high power.

QUESTION: 005 (1.00)

An indication of a heat exchanger leak would be:

a. a high level alarm in the fuel loading tank.

b. a high level alarm in the core tank.

c. a reduction of secondary coolant flow.

d. a reduction of primary coolant flow.

QUESTION: 006 (1.00)

The purpose of the graphite reflector is to:

a. reduce radiation levels in the reactor cell area.

b. increase the worth of the control rods.

c. shield the nuclear detectors from outside radiation sources.

d. increase the neutron population in the core region.

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

QUESTION: 007 (1.00)

Which ONE of the following control rod position indicating devices is interlocked to prevent energizing the electromagnets unless all rods are fully inserted?

a. Separation switch.

b. Drive-Out limit switch.

c. Drive-In limit switch.

d. Safety-Rod-In Position switch.

QUESTION: 008 (1.00)

The normal flow path for primary cooling water, starting at the reactor outlet, is:

a. hold-up tank, air trap, flow orifice, primary pump, reactor inlet.

b. primary pump, heat exchanger, flow orifice, air trap, reactor inlet.

c. flow orifice, heat exchanger, air trap, primary pump, reactor inlet.

d. flow orifice, hold-up tank, primary pump, heat exchanger, reactor inlet.

QUESTION: 009 (1.00)

Reactor instrumentation and the control rod drive motors receive power from:

a. a direct 220/115 VAC feed from the lighting distribution panel.

b. a 220/115 VAC feed through the instrument isolation transformer.

c. the 24 VDC power distribution circuit.

d. the reactor console power distribution circuit.

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

QUESTION: 010 (1.00)

Reactor cell pressure, with respect to surrounding areas, is maintained:

a. positive, by the Hoffman blower admitting outside air.

b. negative, by the Hoffman blower discharging through the furnace stack.

c. positive, by the ventilation fan admitting air from Building 105.

d. negative, by the ventilation fan discharging through the NTR stack.

QUESTION: 011 (1.00)

Which ONE of the following rod drive operations is possible with the reactor keylock switch in the “OFF” position?

a. Bypassing the “all-in” interlock.

b. Driving rod motors using the “IN” pushbutton.

c. Rod withdrawal using the rod test and interlock circuit.

d. Overriding the scram insert signal on one rod at a time.

QUESTION: 012 (1.00)

Which ONE of the following conditions will NOT cause the non-coincident logic unit to deenergize the power switches?

a. A high trip signal from one of the picoammeters.

b. A high trip signal from two picoammeters.

c. Loss of high voltage on two CICs.

d. Loss of voltage on one coincident channel with a high trip signal on the other channel.

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

QUESTION: 013 (1.00)

During make-up water addition to the primary coolant system, overpressure protection is provided by:

a. check valve CV-217 in the make-up water line from Building 105 supply.

b. pressure drop across the ion exchanger from Building 105 supply.

c. an alarm generated by the core delta-P transmitter.

d. a vent line from the heat exchanger inlet to the hold-up tank.

QUESTION: 014 (1.00)

The secondary coolant solenoid cutoff valve SV-203 opens when:

a. inlet pressure at the heat exchanger exceeds 35 psig.

b. the reactor console power switch is ON.

c. the primary coolant high temperature relay energizes.

d. a high alarm level occurs in the fuel loading tank.

QUESTION: 015 (1.00)

The neutron source drive is identical to the rod drives in all respects, except:

a. the position indication reads out in percent withdrawn and rods must be “all-in” before the source can be withdrawn.

b. the position indication reads out in inches withdrawn and rods cannot be moved unless the source is “full-in.”

c. position indication is not provided and it is not necessary to pull any safety rods to with draw the source.

d. position indication is not provided and all safety rod magnets must be energized to withdraw the source.

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

QUESTION: 016 (1.00)

Which ONE of the following area radiation monitors is interlocked with the shutter and door controls to prevent inadvertent exposure to a radiation beam from the reactor?

a. Control room radiation monitor.

b. North room radiation monitor.

c. South cell radiation monitor.

d. Reactor cell radiation monitor (reactor operating).

QUESTION: 017 (1.00)

Which ONE of the following experimental facilities produces the LEAST reactivity effects due to loading or unloading of experiments?

a. Vertical facility.

b. Horizontal facility.

c. Loading chute facility.

d. Face facility.

QUESTION: 018 (1.00)

Operation with one picoammeter out of service is possible if:

a. power is less than 0.1 kW.

b. the coincidence logic unit is configured for 1-out-of-2 operation.

c. rods are not withdrawn beyond their present positions.

d. the other picoammeters are switched to the non-coincident logic unit.

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

A. REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS

ANSWER: 001 (1.00)
C.
REFERENCE:
Reactor Physics Training Manual, Section I, Reactor Kinetics.
Shutdown reactivity = (K-1)/K = -0.047 delta K/K. $7.00 added = 7(0.007) = +0.049 delta K/K.
-0.047 + 0.049 = + 0.002, i.e. supercritical.

ANSWER: 002 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section D, Neutron Multiplication Factors.
In order to decrease K, thermal utilization must decrease.

ANSWER: 003 (1.00)
B.
REFERENCE:
Reactor Physics Training Manual, Section E, Neutron Slowing Down Theory.

ANSWER: 004 (1.00)
C.
REFERENCE:
Reactor Physics Training Manual, Section E, Neutron Slowing Down Theory.

ANSWER: 005 (1.00)
B.
REFERENCE:
Reactor Physics Training Manual, Section H, Subcritical Multiplication.

ANSWER: 006 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section H, Subcritical Multiplication.

ANSWER: 007 (1.00)
D.
REFERENCE:
Reactor Physics Training Manual, Section F, Fission Product Poisoning.

ANSWER: 008 (1.00)
B.
REFERENCE:
Reactor Physics Training Manual, Section I, Reactor Kinetics.
delta k/k = reactivity($) x beta = 0.20 x 0.0073 = 0.0015

ANSWER: 009 (1.00)
C.
REFERENCE:
Reactor Physics Training Manual, Section D, Neutron Multiplication Factors.

ANSWER: 010 (1.00)
B.

REFERENCE:
Reactor Physics Training Manual, Section I, Reactor Kinetics.

ANSWER: 011 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section I, Reactor Kinetics.

ANSWER: 012 (1.00)
C.
REFERENCE:
Reactor Physics Training Manual, Section C, The Nuclear Fission Process.
Increase = $1.001 \times 10^8 - 1 \times 10^8 = 1 \times 10^5$. Prompt neutron population = $0.993 \times 1 \times 10^5 = 99{,}300$.

ANSWER: 013 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section B, Types of Nuclear Reactions.

ANSWER: 014 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section H, Subcritical Multiplication.

ANSWER: 015 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section D, Neutron Multiplication Factors.

ANSWER: 016 (1.00)
C.
REFERENCE:
Reactor Physics Training Manual, Section H, Subcritical Multiplication.

ANSWER: 017 (1.00)
A.
REFERENCE:
Reactor Physics Training Manual, Section I, Reactor Kinetics.

ANSWER: 018 (1.00)
D.
REFERENCE:
Reactor Physics Training Manual, Section D, Neutron Multiplication Factors.

ANSWER: 019 (1.00) DELETED
A.
REFERENCE:
Reactor Physics Training Manual, Section A, basic Reactor Physics Definitions.

ANSWER: 020 (1.00)
D.
REFERENCE:
Reactor Physics Training Manual, Section D, Neutron Multiplication Factors.

B. NORMAL/EMERGENCY PROCEDURES & RADIOLOGICAL CONTROLS

ANSWER: 001 (1.00)
B.
REFERENCE:
Radiological Emergency Plan, Section 5.2.

ANSWER: 002 (1.00)
A.
REFERENCE:
SOP 9.9, Visitor Control.

ANSWER: 003 (1.00)
B.
REFERENCE:
Radiological Safety at Vallecitos Nuclear Center, Page 26.

ANSWER: 004 (1.00)
C
REFERENCE:
Technical Specifications Section 6.1.3.1.

ANSWER: 005 (1.00)
C.
REFERENCE:
SOP 8.3, Abnormal Operation.

ANSWER: 006 (1.00)
B.
REFERENCE:
Technical Specifications, Section 2.2.3.

ANSWER: 007 (1.00)
B.
REFERENCE:
Radiological Safety at Vallecitos Nuclear Center, Page 12.
With the window closed, only gamma radiation penetrates the window.

ANSWER: 008 (1.00)
D.
REFERENCE:
SOP 7.9, Radiation Work Permit.

ANSWER: 009 (1.00)
B.
REFERENCE:
Technical Specifications, Section 1.3.

ANSWER: 010 (1.00)
C.
REFERENCE:
Radiological Safety at Vallecitos Nuclear Center, Pages 16, 20.
$DR_1D_1^2 = DR_2D_2^2$; 10 mrem/hr at one meter (100 cm.) results in 111.1 mrem/hr at 30 cm.

ANSWER: 011 (1.00)
D.
REFERENCE:
Technical Specifications Section 3.1.3.5.

ANSWER: 012 (1.00)
C.
REFERENCE:
GENTR License.

ANSWER: 013 (1.00)
D.
REFERENCE:
Technical Specifications, Section 6.1.3.2.

ANSWER: 014 (1.00)
B.
REFERENCE:
Radiological Safety at Vallecitos Nuclear Center, Page 15.

ANSWER: 015 (2.00)
B.
REFERENCE:
SOP 3.5, Manual Poison Sheets.

ANSWER: 016 (1.00)
A.
REFERENCE:
Technical Specifications, Section 3.3.4.

ANSWER: 017 (2.00)
A,4; B,2; C,2; D,1.
REFERENCE:
10 CFR 55.

ANSWER: 018 (1.00)
D.
REFERENCE:
Radiological Safety at Vallecitos Nuclear Center, Page 11.
GM tube cannot distinguish between energies.

ANSWER: 019 (1.00)
A.
REFERENCE:
GENTR Requalification Plan.

C. FACILITY AND RADIATION MONITORING SYSTEMS

ANSWER: 001 (1.00) DELETED
D.
REFERENCE:
SOP 5.1, Ventilation System and SOP 1.1, Primary Cooling System.

ANSWER: 002 (1.00)
A.
REFERENCE:
SOP 1.1, Primary Cooling System.

ANSWER: 003 (1.00)
D.
REFERENCE:
SOP 2.4, Picoammeter Channels.

ANSWER: 004 (1.00)
C
REFERENCE:
SOP 2.1, Safety Systems.

ANSWER: 005 (1.00)
A.
REFERENCE:
SOP 1.5, Secondary Cooling System.

ANSWER: 006 (1.00)
D.
REFERENCE:
GE NTR Safety Analysis Report, Sections 4.5 and 4.7.

ANSWER: 007 (1.00)
C.
REFERENCE:
GE NTR Safety Analysis Report, Section 8.5.

ANSWER: 008 (1.00)
C.
REFERENCE:
GE NTR Safety Analysis Report, Figure 5-1.

ANSWER: 009 (1.00)
D.
REFERENCE:
GE NTR Safety Analysis Report, Section 6.2.

ANSWER: 010 (1.00)
D.
REFERENCE:
GE NTR Safety Analysis Report, Section 6.7.

ANSWER: 011 (1.00)
B.
REFERENCE:
GE NTR Safety Analysis Report, Section 8.5 and Figure 8.3.

ANSWER: 012 (1.00)
A.
REFERENCE:
GE NTR Safety Analysis Report, Section 8.3.3.

ANSWER: 013 (1.00)
D.
REFERENCE:
GE NTR Safety Analysis Report, Section 5.2.

ANSWER: 014 (1.00)
B.
REFERENCE:
GE NTR Safety Analysis Report, Section 5.3; SOP 1.6, steps 5.9 and 5.11.

ANSWER: 015 (1.00)
C
REFERENCE:
GE NTR Safety Analysis Report, Section 8.8.

ANSWER: 016 (1.00)
C.
REFERENCE:
GE NTR Safety Analysis Report, Section 8.6.

ANSWER: 017 (1.00)
D.
REFERENCE:
GE NTR Safety Analysis Report, Section 7.10.

ANSWER: 018 (1.00)
B
REFERENCE:
GE NTR Safety Analysis Report, Section 8.6.

A. REACTOR THEORY, THERMODYNAMICS AND 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 & 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 _____

017 a_____b_____c_____d _____

018 a b c d _____

019 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 _____

(***** END OF CATEGORY C *****)
EQUATION SHEET

$Q = m\ c_p\ \rho T$

$CR_1\ (1\text{-}Keff)_1 = CR_2\ (1\text{-}Keff)_2$

$SUR = 26.06/\rho$

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

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

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

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

$DR_1D_1^2 = DR_2D_2^2$

$DR = DR_o e^{-\rho t}$

$DR = 6CiE/D^2$

$\rho = (Keff\text{-}1)/Keff$

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

$1\ Curie = 3.7x10^{10}$ dps

1 gallon water = 8.34 pounds

1 Btu = 778 ft-lbf

$°F = 9/5°C + 32$

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

$°C = 5/9\ (°F - 32)$