EXAMINATION REPORT
Report Number: 50-128/OL-85-02

Docket No: 50-128 License: R-83

Licensee: Texas A&M University
Texas Engineering Experiment Station
College Station, Texas 77843

Examinations administered for NSC TRIGA

Chief Examiner: S L McCrory 2/6/85
S. L. McCrory, Examiner Date

Approved by: R. A. Cooley 2/6/85
R. A. Cooley, Section Chief Date

Summary

Examinations conducted on January 30, 1985.

A written examination was administered to one Senior Reactor Operator. The Senior Reactor Operator passed this examination.

EXAMINATION REPORT
Report No. 50-128/OL-85-02

Report Details

1. Examination Results

SRO Candidates				RO Candidates			
Total	Pass	Fail	%	Total	Pass	Fail	%
1	1	0	100	0	0	0	NA

2. Examiners

S.L. McCrory, Chief Examiner, NRC

3. Examination Report

This Examination Report is composed of the sections listed below.

A. Examination Review Meeting Comment Resolution

B. Exit Meeting Minutes

C. NSC TRIGA Examination Key (SRO/RO Questions and Answers)

Performance results for individual candidates are not included in this report because, as noted in the transmittal letter attached, examination reports are placed in NRC's Public Document Room as a matter of course.

A. Examination Review Meeting Comment Resolution

In general, editorial comments or changes made during the exam, the exam review, or subsequent grading reviews are not addressed by this resolution section. This section reflects resolution of substantive comments made during the exam review. The modifications discussed below are included in the master exam key which is provided elsewhere in this report as are all other changes mentioned above but not discussed herein. The following personnel were present for the exam review:

NRC	TAMU
S. L. McCrory	D. Rogers

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COMMENTS

1. H.3 The Temperature Coefficient of TRIGA reactors is also strongly influenced by the presence of Ebrium in the fuel bundle and should be credited in the answer.
   Resp. ACCEPT

2. H.6 The picoammeter is used to determine the reactor period and reactivity is calculated from the in-hour equation only.
   Resp. ACCEPT

3. I.4 The doses are usually expressed as a percentage of the quarterly limit.
   Resp. ACCEPT

4. K.1 The requirement to inspect fuel after 25 pulses no longer applies and should be deleted.
   Resp. ACCEPT

5. L.5 The maximum reactivity addition allowed for a pulse is based on not exceeding 830°C. The specific value is imperically determined on a periodic bases.
   Resp. ACCEPT

B. Exit Meeting Summary

At the conclusion of the examination, the examiner met with the representative of the NSC staff to discuss the results of the examination. The following personnel were present for the exit interview:

NRC	TAMU
S. McCrory	D. Rogers

Since the examination consisted of a written examination only, the examiner could only indicate that the grade results would be available the week of February 3, 1985.

C. NSC TRIGA EXAMINATION KEY

Date Administered: January 30, 1985
Exam Type: Senior Reactor Operator

TAMU NSC EXAMINATION KEY

H. REACTOR THEORY

H.1 After three days of continuous operation at 200 KW, the reactor is shut down for minor maintenance. It is restarted 8 hours after shutdown. (2.5)

A. How will the critical rod position on restart compare to the critical rod posistion on startup 3 days ago? Explain.

B. What kind of rod motion would you expect to use to go from just critical to 200 KW and maintain that steady state power level for the next 24 hours?

ANS:

A. The critical rod height on restart will be higher due to the increase in Xe during shutdown which added negative reactivity.

B. Initially, rods must be withdrawn to increase power to 200 KW. As Xe is burned out from its peak value, rods must be moved in. Eventually, Xe will reach a minimum value and will begin to increase to equalibrium value for the steady state power level. At this time rods will have to be moved out to keep power steady.

REF:

Basic Rx Theory

Question value is 2.5 pts, 1 pt for A. and 1.5 for B., 0.5 ea for the three phases.

H.2 Discuss the difference between fissile and fertile material. Give an example of each. (3.0)

ANS:

Fissile Material will fission with all energies of neutrons.
Example: U-235, U-233, Pu-239

Fertile Material has a fission threshold of about 1 MeV. After capturing a thermal neutron it can decay (after 2 Beta emissions) to a fissile material.
Example: U-238, Th-232

REF:

Basic Rx Theory

Question value is 3 pts, 1 pt each for definitions and 0.5 each for example. Only one example per definition is required.

H.3 Uranium-fueled light water reactors inherently have large negative temperature ccefficients. (3.0)

A. Explain why.

B. From the nuclear physics standpoint, why does the use of Zirconium Hydride compliment this?

ANS:

A. It is largely due to the Doppler broadening of the capture resonances. So much so that it is often called the Doppler Coefficient. Broadening of resonances embraces more neutron energies to be captured, thus lowering available thermal neutrons. (There is also a small negative density change and an even smaller positive buckling change.) A discussion of spectrum harding due to Ebrium is also acceptable.

B. The moderation ability of the ZrH lessens as the fuel temperature increases. This is a prompt effect and lessens thermal neutrons available for additional thermal fissions. During a pulse a high thermal power level is reached. The loss of substantial moderation capacity is equivalent to a large insertion of negative reactivity.

REF:

Basis Rx Theory

Question value is 3 pts, 1.5 pts each.

H.4 A. Give an explanation for the change of core reactivity with moderator temperature. (1.5)

B. What conditions would cause the sign of the temperature coefficient of reactivity to change? (1.5)

ANS:

A. A temperature change in the moderator will affect the moderator/fuel ratio. This will cause thermalization of the neutrons to a greater or lesser extent prior to their reaching the fuel pins and will determine the absorption rate of the neutrons in the moderator or in U-238.

A change in moderator temperature will affect the neutron migration length which will cause more or less neutron leakage.

B. The sign of the moderator temperature coefficient (MTC) is dependent on the moderator/fuel ratio. A reactor that is "overmoderated" will have a positive MTC while one that is "undermoderated" will have a negative MTC. Most reactors are designed with a negative MTC at normal operating parameters. However, many will go to a positive MTC at lower temperatures due to the increase in moderator density.

REF:

Basic Rx Theory

Question value is 3 pts distributed as indicated.

H.5 Explain why the worth of a control rod varies with its radial position in the core. (2.0)

ANS:

A control rod's worth is proportional to the square of the flux in which it operates. As the flux density decreases as you move out radially from the core centerline, the worth of a control rod decreases similarly.

REF:

Basic Rx Theory

Question value is 2 pts, 1 pt for flux behavior, and 1 pt for rod worth to flux relation.

H.6 Outline the "positive period" method for measuring the differential reactivity worth of a control rod. (3.0)

ANS:

1. With the rod to be calibrated fully inserted, bring the reactor critical at a low power to minimize temperature effects.
2. Move the rod out until the reactor is slightly supercritical. (Positive period less than infinity)
3. Allow transients to die out.
4. Determine reactor period using the picoammeter.
5. Insert the other rods to make the reactor just critical.
6. Repeat steps 2 - 5 until the rod is fully withdrawn.
7. Calculate reactivity using the in-hour equation.
8. Obtain a differential rod worth curve by ploting reactivity vs rod position.

REF:

NSC ROD WORTH CALCULATION PROCEDURE

Question value is 3 pts, a full credit answer need not follow the steps exactly, but should cover all the major concepts.

H.7 A. What is the importance of the neutron lifetime on the pulsing characteristics of the TRIGA? (1.5)

B. How does the neutron lifetime differ between a TRIGA that is graphite reflected and one that is water reflected? (1.5)

ANS:

A. The peak power of a pulse is inversely proportional to the neutron lifetime. Therefore, the shorter the lifetime, the higher the peak. (It should be noted that the neutron lifetime has no effect on total power produced in peak.)

B. Since neutron lifetime is the time from introduction of the neutron to the system from fission to the loss of the neutron from the system by absorption or leakage, it follows that graphite, which has a lower absorption cross-section will result in a longer neutron lifetime.

REF:

Basic Rx Theory

Question value is 3 pts as indicated.

H.8 A reactor is operating at 1 Mw (100% full power) and the reactor scram is set for 125% full power. What will be the peak power if a nuclear excursion creates a 100 millisecond period and the scram delay time is 0.1 seconds after reaching 125% power? (Assume no temperature c- void effects.) Show all work. (2.0)

ANS:

$T = 100 \times 10^{-3}\text{sec} = 0.1 \text{ sec}$

$P_f = P_i \times e^{t/T}$

$P_f = 1.25 \text{ Mw} \times e^{.1/.1} = 1.25 \text{ Mw} \times e = 1.25 \text{ Mw} \times 2.72$

$P_f = 3.4 \text{ Mw}$

REF:

Basic Rx Theory

Question value is 2 pts, 1 pt for formulation, and 1 pt for final answer.

H.9 If the Beta for your reactor was changed from its actual value to 0.0035, show mathematically how the reactor period would be affected for equal positive reactivity insertions with each Beta value. (1.5)

ANS:

Acutal Beta value = 0.0065 - 0.0072

$$T = \frac{l}{p - B}$$

T= period, l= neutron life, p= reactivity (rho), B= Beta

With l and p constant, if B goes down then T goes down.

REF:

Basic Rx Theory

Question value is 1.5 pts, 0.5 each for Beta value, formulation, and proof.

END OF CATEGORY

TAMU NSC EXAMINATION KEY

I. Radioactive Materials Handling
Disposal and Hazards

I.1 A. What is the whole body limit per quarter for individuals in a restricted area as set by 10 CFR 20? (1.0)

B. A licensee may permit an individual to receive a greater whole body dose in a quarter provided two limits are not exceeded and one administrative condition is met. Give 2 of the 3 provisions. (2.0)

ANS:

A. 1.25 R/qtr

B. (any 3)
1. 3 R/qtr
2. less than 5(N-18) R (total life)
3. NRC-4 form

REF:

10 CFR 20

Question value is 3 pts, 1 pt each for A, B1, and B2.

I.2 A gamma source located 2 feet below the surface of the pool measures 4 R/hr at 1 foot above the surface of the pool. The source is to be removed using 6 ft. tongs and placed in a shielded cask. (3.0)

A. What dose rate will reach the handler during the transfer?

B. If the transfer takes 15 seconds, what dose will the handler receive?

Show all work and assume the ½ thickness of water is 8 inches.

ANS:

A. Unshielded dose rate at 3 ft.

$DR_u = DR_s \times 2^n$ n = no. of ½ thicknesses

$DR_u = 4$ R/hr X 2^3 = 4 R/hr X 8 = 32 R/hr at 3 ft.

Dose rate at 6 ft.

$DR_6 = DR_3 \times R_3^2/R_6^2 = 32 \times 3^2/6^2$

DR_6 = 8 R/hr

B. Dose received

$8R/hr \times \frac{15 \text{ sec}}{3600 \text{ sec/hr}} = 33 \text{ mr}$

REF:

Basic Radiation Characteristics

Question value is 3 pts, 1 pt each for formula selection and use, and 0.5 pt each for final answer.

I.3 A. What are the fission product gases generated during reactor operation? (1.0)

B. List 2 methods for detecting these gases if released into the reactor building. (1.0)

ANS:

A. Xenon and Krypton

B. Gaseous analyzer or Air Particulate analyzer (particulate daughter products)

REF:

Basic Rx Physics

Question value is 2 pts, 0.5 for each of 4 required.

I.4 When is personal dosimetry <u>required</u> to be issued with respect to radiation levels or expected doses? (3.0)

ANS:

Personal dosimetry will be issued to those personnel who:

1. Enter a restricted area such that a dose of 312 mrem (25% of qtrly) whole body could be received in 1 quarter.

2. Are under 18 years of age and enter an area where a dose of 62 mrem (5% of qtrly) could be received in 1 quarter.

3. Enter a high radiation area.

REF:

NSC SOP VII-E, pg 1

Question value is 3 pts, 1 pt each.

I.5 Explain the result of operating the reactor with increasing pool water conductivity? (1.0)

ANS:

Radiation levels in the reactor building would rise due to activation of impurities in the pool water.

REF:

BASIC NUCLEAR PHYSICS

Question value is 1 pt, 0.5 each for rad increase and why.

I.6 List four ways that radioactive contaminants may enter the body and become an internal radiation exposure hazard. (2.0)

ANS:

1. Inhalation
2. Ingestion
3. Absorption
4. Injection (open wound)

REF:

BASIC RAD CON.

Question value is 2 pts, 0.5 each.

I.7 Arrange the following list of radiation forms in order of greatest to least biological impact from the standpoint of **EXTERNAL** exposure. (2.0)

1. Gamma
2. Alpha
3. Fast Neutron
4. Beta
5. Thermal Neutron

Ans:

Fast Neutron		3
Thermal Neutron		5
Gamma	**OR**	1
Beta		4
Alpha		2

Ref:

10 CFR 20.4

Question value is 2 pts, 0.5 per wrong shift (maximum of 4).

END OF CATEGORY

J. SPECIFIC OPERATING CHARACTERISTICS

J.1 A. What is the Technical Specification limit for shutdown margin? Include all conditional considerations. (2.0)

B. What steps are performed to verify that the limit is not exceeded? (2.0)

ANS:

A. Greater than 25¢ with:

1. Highest worth non-secured experiment in its most reactive state.

2. Highest worth control rod and the regulating rod (if not scrammable) fully withdrawn.

3. Reactor in cold shutdown and Xe free.

B. 1. Perform a rod worth calibration.

2. Obtain the 300 w critical rod ht.

3. Compute core excess rod worth (total - 300 w)

4. Compute highest experiment worth.

5. Subtract values for:
   highest rod worth
   regulating rod
   highest experiment worth
   core excess worth
   from the total calibrated rod worth to get SDM.

REF:

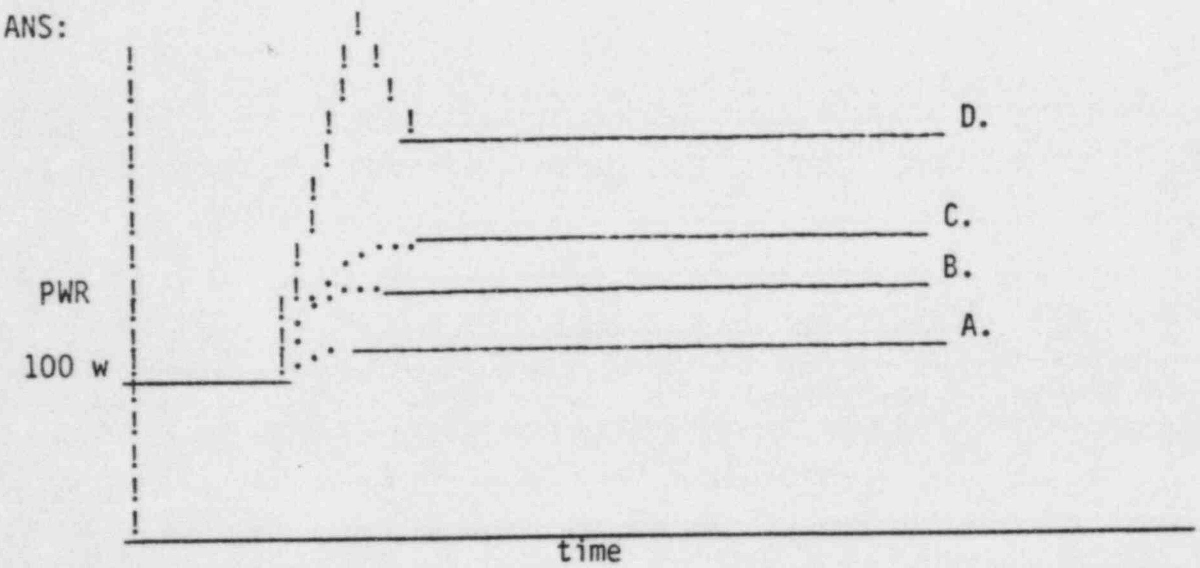
A. NSC TS pg 13
B. NSC SOP III-M pgs 1, 2.

Question value is 4 pts, 0.5 each in A, and 0.4 each in B.

J.2 On figure J.2 draw a set of curves showing the reactor's power vs time response for each of the following reactivity insertion steps (assmue the initial power is 100 w in each case and that the preset timer <u>does</u> <u>not</u> scram the transient rod): (2.0)

A. 15¢
B. 35¢
C. 74¢
D. $2

ANS:



REF:

Reactor Test Curves

Question value is 2 pts, 0.5 each.

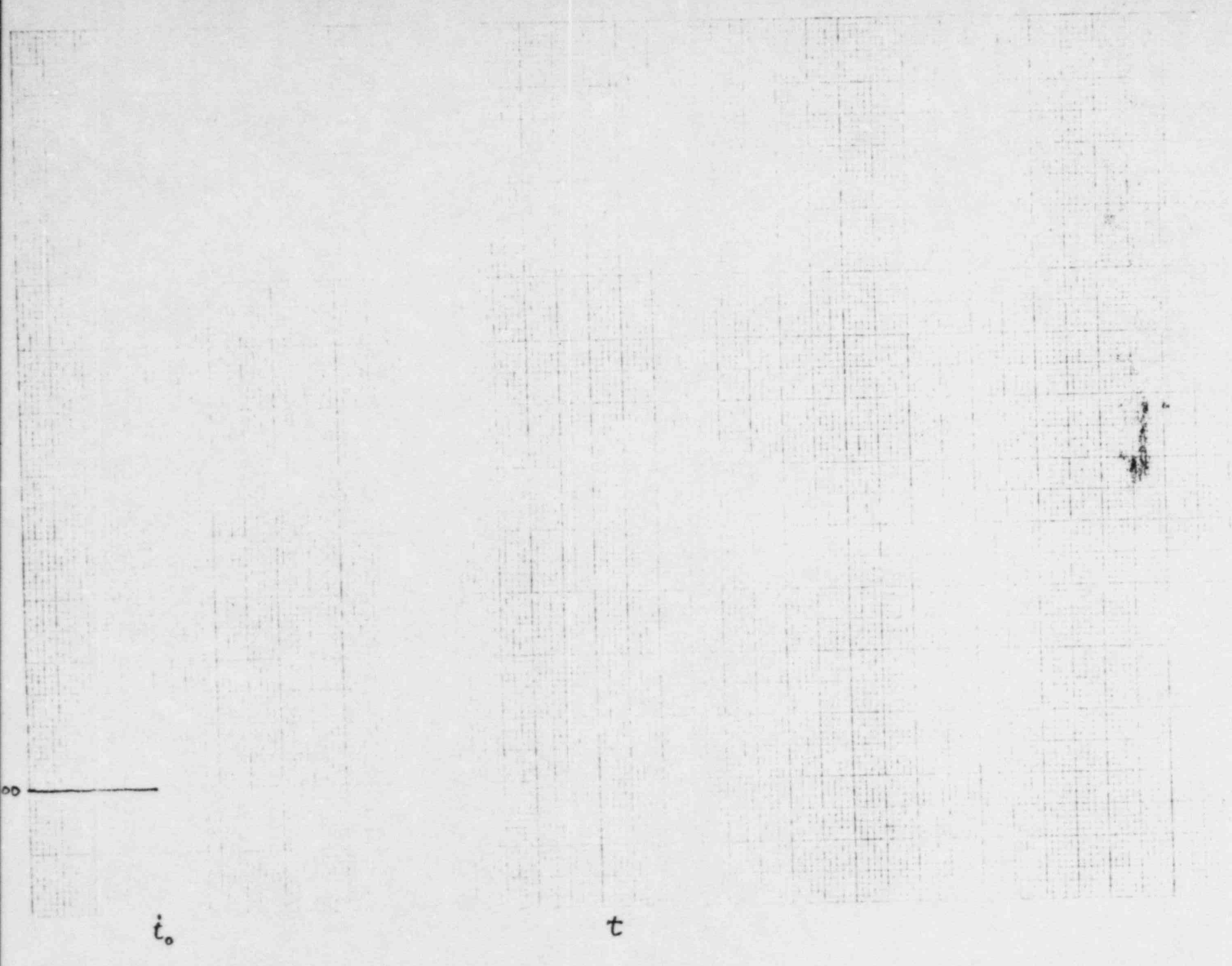


Figure J.2

J.3 A. What is the limiting safety system setting (LSSS)? (0.5)

B. What is its basis? Consider both types of fuel used in TRIGA reactors. (1.0)

C. List four (4) reactor safety circuits applicable to steady state operation which help prevent exceeding the LSSS (2.0)

ANS:

A. 525°C (975°F)

B. This setting will initiate a scram which will prevent exceeding 950°C for FLIP and 800°C for standard fuel cores. This provides a margin greater than or equal to 200°C from the safety limits for 1150°C (flip) and 1000°C (standard).

C. (any 4)
1. Fuel element temperature
2. Hi power level
3. Manual (console)
4. Hi power level detector power supply
5. Log power (LT 4 X 10^{-3}watt)
6. Transient Rod position (no air unless full in)

REF:

NSC TS pgs 9, 16

Question value is 3.5 pts, 0.5 each.

J.4 Fill in the blanks (on a separate answer sheet) in the paragraph below dealing with a Loss of Coolant Accident (LOCA). Blanks may represent one or more words, phrases, or numbers. (2.0)

The maximum temperature that FLIP fuel can tolerate in air without damage to the clad is _____. This temperature will not be exceeded during a LOCA if the maximum power density in an element is limited to _____ for any reactor power history. If reactor power history is limited to ____, power densities up to ____ will not cause element damage.

ANS: $1720^{0}F$ ($940^{0}C$),
23 kw/ft,
70 Mw-hrs/wk,
28 kw/ft

REF:
TAMU NSCR TRIGA FSAR, p. 142

Question value is 2 pts, 0.5 each.

J.5 Figure J.5 is a trace of reactor power vs time for a $1.75 pulse. Explain what is happening to cause the shape of the curve for each of the regions indicated. (3.0)

ANS:

1. The reactor is prompt supercritical causing an almost instant power increase.

2. The fuel temperature coefficient turns and drops power toward a new steady state value.

3. The transient rod is scrammed causing a prompt drop in power and then leveling to steady state power.

REF:

NSC OPERATING CURVES, CORE CHARACTERISTICS, AND CONTROL SYSTEMS DESIGN.

Question value is 3 pts, 1 pt each.

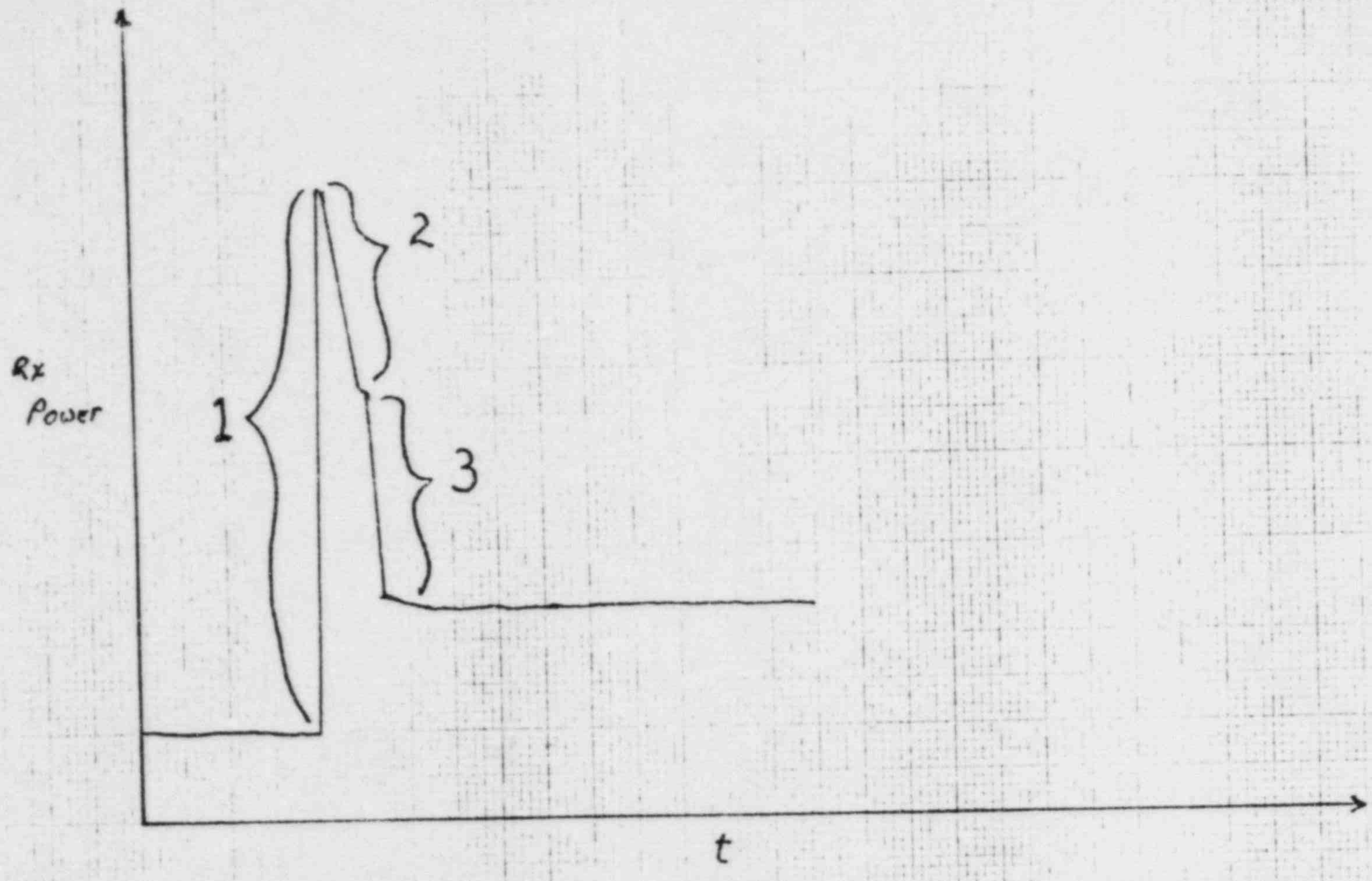


Figure J.5

J.6 If the reactor is operated at a constant power level continually until the end of a core life, explain how and why flux varies. (1.5)

ANS:

The fission rate remains constant but the leakage and absorption factors decrease as rods move out and are replaced by water so that average flux density increases.

REF:

BASIC RX THEORY

Question value is 1.5 pts, 0.5 for increase and 1 pt for explanation.

END OF CATEGORY

K. FUEL HANDLING & CORE PARAMETERS

K.1 A. What are the requirements for checking fuel elements? (2.0)

B. What are the limits on elements that will not allow the reactor to be pulsed? (2.0)

ANS:

A. 1. Annually visually inspect at least 20% of all fuel elements at least 4 of which must come from the highest pulse temperature position.

2. Inspect all fuel elements if one is found damaged.

B. 1. Bend greater than .125 inch over clad length.

2. Elongation greater than .125 inch from original.

3. Clad defect releasing fission products.

REF:

NSC TS pg 32 and SOP-H pg 1

Question value is 4 pts, 0.5 eaci in A and 0.66 each in B.

K.2 What are the constraints on core configuration (composition, arrangement, and instrumentation) to allow reactor operation? (3.0)

ANS:

1. The TRIGA core assembly may be standard, FLIP, or a combination thereof (mixed core) provided that any FLIP fueled core be comprised of at least thirty-five (35) fuel elements, located in a contiguous, central region.

2. The reactor shall not be taken critical with a core lattice position vacant except for positions on the periphery of the core assembly. Water holes in the inner fuel region shall be limited to single rod positions. Vacant core positions shall contain experiments or an experimental facility to prevent accidental fuel additions to the reactor core.

3. The instrumented element shall be located adjacent to the central bundle with the exception of the corner positions.

REF:

NSC TS pg 14

Question value is 3 pts, 1 pt each.

K.3 What is the minimum crew necessary to perform fuel loading and unloading? (2.0)

ANS:

1. 1 SRO (NSC Manager)
2. 1 RO/SRO in control room.
3. 1 Fuel Handler
4. 1 HP

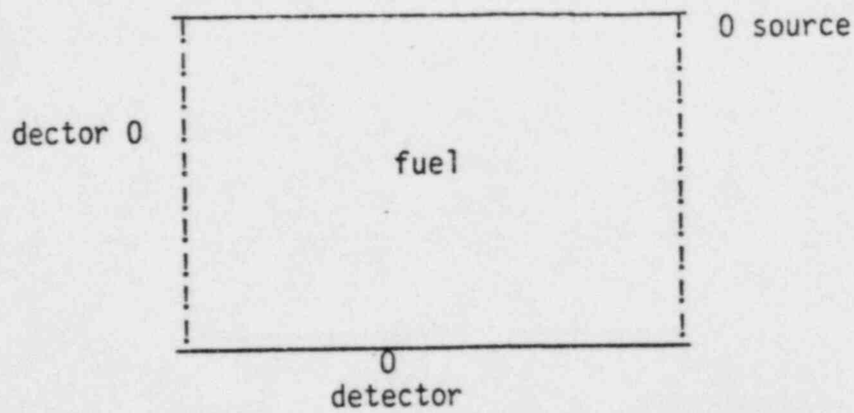
REF:

NSC SOP II-I pgs 1, 2

Question value is 2 pts, 0.5 each.

K.4 Sketch the physical arrangement of the source, fuel, and detectors during fuel load and discuss why this arrangement is preferred. (3.0)

ANS:



This arrangement allows the detectors to "see" the effects of fuel addition without being shadowed by source neutrons.

REF:

NSC FUEL HANDLING MATERIAL

Question value is 3 pts, 2 pts for drawing and 1 pt for explanation.

K.5 What are the Technical Specifications pertaining to the storage of the following: (2.5)

A. Fuel Elements?

B. Irradiated fuel elements and fueled devices?

ANS:

A. Stored in a geometrical array such that K_{eff} LT 0.8 for all conditions of moderation.

B. Stored in an array which will permit sufficient natural circulation cooling by water or air such that the final element or device temperature will not exceed design values.

REF:

NSC TS

Question value is 2.5 pts, 1 pt for A. and 1.5 pts for B.

K.6 Outline the procedure for entry into the irradiation cell following operation with the reactor against the irradiation window. (3.0)

ANS:

1. Shutdown and secure the reactor
2. Remove the key ring from the reactor console and give to SRO.
3. Raise the reactor yoke
4. Unlock the reactor bridge.
5. Position the reactor core GE 8 ft from the radiation window and lock the mechanincal stops in place.
6. Lock the reactor bridge in place.
7. SRO unlock access door to irradiation cell.
8. HP perform a radiation survey inside the cell
9. Experimenters will have SRO and HP permission prior to entry and will wear protective clothing as prescribed by HP and the SRO.

REF:

NSC SOP IV-E-2

Question value is 3 pts. Look for key elements of core condition, postion, and physical restraint, and rad protection measures.

K.7 Name the three (3) fuel handling tools available for use during fuel manipulations and their normal storage locations. (1.5)

ANS:

Fuel element handling tool - Reactor Supervisor's closet.
Flexible fuel bundle h. t. - " " ".
Rigid fuel bundle h. t. - Tool rack in N.E. corner of pool.

REF:

NSC SOP II-H, p. 2

Question value is 1.5 pts, 0.5 each.

END OF CATEGORY

TAMU NSC EXAMINATION KEY

L. ADMINISTRATIVE PROCEDURES, CONDITIONS AND LIMITATIONS

L.1 Title 10 Part 55 defines an operator as "any individual who manipulates a control of a facility." (3.0)

A. Define the term "control" as used in this regulation.

B. What are the exceptions which do not require a license to manipulate the controls?

C. When is a Senior Operator required to be present at the facility?

ANS:

A. Refers to apparatus and mechanisms of a nuclear reactor whose manipulation directly affect reactivity or power level of the reactor.

B. A trainee under the direct supervision of a licensed operator may manipulate controls.

C. Any time the reactor is not secured by definition.

REF:

10 CFR 55, NSC SOPs

Question value is 3 pts, 1 pt each.

L.2 During a reactor scram, one of the safety rods fails to drop. What must be done prior to restarting the reactor? (2.0)

ANS:

1. Ensure the reactor is shutdown
2. Notify management and NRC (if applicable)
3. Determine cause of stuck rod
4. Repair rod or affected control system
5. Test all affected systems, components, and safety circuits.
6. Obtain permission from NRC for restart if required.

REF:

NSC SOPs and TS

Question value is 2 pts, 0.4 each, #6 is optional.

L.3 Describe the rod withdrawal sequence for normal startup to steady state operations. Include the reactor period limits both prior and subsequent to criticality. (3.0)

ANS:

1. Pull transient rod to upper limit of travel.
2. Pull regulating rod to mid-range (40-60%).
3. Pull shim safety rods for a reactor period GE 20 sec until critical then establish a reactor period GE 10 sec until desired power is achieved.

REF:

NSC SOP II-C pg 2

Question value is 3 pts, 0.8 each for rod sequence, 0.3 each for reactor periods.

L.4 For subsequent startups during the same day, describe the prestartup checks that must be performed if the bridge has been moved between shutdown and startup. (2.0)

ANS:

The scram circuits must be checked by;

1. Raise all scrammable rods
2. Manually scram the rods
3. Look for proper operation of all rods.

REF:

NSC SOP II-C pg 3

Question value is 2 pts, 0.5 each.

L.5 When conducting pulsing operations: (4.0)

A. What is the maximum reactivity addition allowed?
B. What is the maximum permitted initial power?
C. How is the maximum reactivity addition controlled or limited?
D. List three (3) reactor safety circuits which apply to pulse operations only.

ANS:

A. Function of not exceeding 830°C. Current value $2.10.
B. 1000 watts
C. A plug is inserted to limit transient rod motion
D. 1. Preset timer (scrams transient rod in LE 15 sec)
   2. Log power circuit (1 Kw upper limit)
   3. Shim safety and reg rod position ckt (prevents withdrawal)

REF:

A. NSC TS
B. NSC SOP II-E pg 2
C. NSC SOP II-E pg 1
D. NSC TS 3.2.2 pg 16

Question value is 4 points, 0.5 each for A, D1-3, and 1 pt each for B and C.

L.6 Give the following limitations and/or requirements applicable to the reactor: (3.0)

A. Personnel (number and qualification) required for operation of the reactor.

B. Maximum available excess reactivity.

C. Maximum and minimum bulk mean temperature limits on reactor pool water and reactor room air.

D. Maximum licensed experiment reactivity worth.

E. Pool water radioactivity limit for reactor operation.

F. Pool water conductivity limit for reactor operation.

ANS:

A. 1 SRO and 1 RO (if SRO in control room a trainee may be RO)

B. \$7.85

C. Generally 40-100°F (no specific limit) for both.

D. LT \$1 for moveable
LT \$2 for any single experiment

E. $4X10^{-7}$ uc/ml

F. Up to 5 umho for a period LE 2 weeks.

REF:

NSC TS, AND 10 CFR 20

Question value is 3 pts, 0.5 each.

L.7 Give the Technical Specification definition for each of the following: (4.0)

A. Abnormal Occurrence
B. Experiment
C. Fuel Bundle
D. Operable
E. Scram Time
F. Shall, Should and May
G. True Value
H. Reactor Shutdown

ANS:

A. An unscheduled event or incident which the NRC determines is significant from the standpoint of public health or safety.

B. An operation, hardware, or target which is designed to investigate non-routine reactor characteristics or which is intended for irradiation ··· and which is not rigidly secured to a core or shield structure so as to be a part of their design.

C. A cluster of two, three or four elements and/or non-fueled elements secured in a square array by a top handle and a bottom grid plate adaptor.

D. A component or system is CAPABLE of performing its intended function.

E. The time measured from the instant a simulated signal reaches the value of the LSSS to the instant that the slowest scrammable control rod reaches its fully inserted position.

F. Shall - requirement
Should - recommendation
May - permission

G. The actual value of a parameter.

H. Subcritical by at least $1 including the reactivity worth of all experiments at ambient temperature and Xe free.

REF:
NSC TS 1.0

Question value is 4 pts, 0.5 each.

L.8 During reactor operation, an experiment fails which releases a substantial amount of radioactive material into the reactor building. The evacuation is sounded. What specific actions and responsibilities do you, as senior reactor operator, have in this situation? (4.0)

ANS:

1. Report to the reception room
2. Contact the HP and review the situation.
3. Verify that the air handling system is in a shutdown condition.
4. Verify that the rope barriers are inplace in the reception room and that the facility entry gate is closed.
5. Verify that all doors to the reactor building are closed or appoint someone to close outside doors if indicated open.
6. Verify all persons are accounted for and designate a person to be incharge of the group assembled in the conference room.
7. Check for external release of radioactive material.

REF:

NSC SOP IX-B-1

Question value is 4 pts, 0.57 each.

END OF CATEGORY