U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-373/OL-85-01

Dockets No. 50-373; 50-374 License Nos. NPF-11; NPF-18

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: LaSalle County Nuclear Station

Examination Administered At: LaSalle County Nuclear Station

Examination Conducted: May 20-24 and June 12-13, 1985

Examiner(s): T. Lang — 9-12-85 Date

L. Dimmock — 9-12-85 Date

C. Kvamme for — 9/12/85 Date

M. King for — 9/12/85 Date

E. Plettner — 9/12/85 Date

Approved By: J. I. McMillen, Chief
Operating Licensing Section — 9/12/85 Date

Examination Summary

Examination administered on May 20-24 and June 12-13, 1985 (Report No. 50-373/OL-85-01)
Thirteen candidates took the written, oral, and simulator examinations and one candidate took the written and oral examinations.
Results: Twelve candidates passed the examination.

REPORT DETAILS

1. Examiners

C. Kvamme, EG&G
M. King, EG&G
T. Lang, Region III
L. Dimmock, Region III*
E. Plettner, Region III

*Chief Examiner

2. Examination Review Meeting

The review of the examinations resulted in numerous comments which were directed to the answer key. The comments and their resolution are listed in Attachment A for the RO, Attachment B for the SRO and Attachment C for the SRO limited.

3. Exit Meeting

During the exit meetings on May 21 and on June 13, 1985, the facility was informed that all the candidates except one had clearly passed the simulator and/or oral examinations that they had been administered.

Attachment A

RESOLUTION TO COMMENTS TO THE LASALLE RO EXAM OF 5/20/85

QUESTION 1.01 c.

FACILITY COMMENT:

Transient period -- even though key is a direct quote from the lesson plan, it still does not directly answer the question. Credit should be given to any logical explanation of transient period, i.e., the rapid increase in neutron flux immediately after rod withdrawal due to prompt neutrons (or before delayed neutrons are produced).

RESOLUTION:

Agree with comment. Credit will be given for any answer which deals with prompt neutrons or the rate of reactivity addition.

QUESTION 1.11

FACILITY COMMENT:

Answer key was wrong in calc. (should have been 3600^2 instead of 3600^3).

RESOLUTION:

Agree with comment. Answer key had typing error in single step of calculation but answer was correct.

QUESTION 1.12

Answer key corrected even though no comment received. Answer changed from 345 sec. to 310.7 sec.

QUESTION 2.01

FACILITY COMMENT:

The FCV physically will not close all the way (approximately 10% open). Do not take off for this answer. (Ref.: Chapter 8, Systems Manual.)

RESOLUTION:

Agree with comment. Credit will not be taken off for stating that the valve does not close completely.

QUESTION 2.03

FACILITY COMMENT:

Also accept that RPT is the only trip that will also trip open the 4A & B breakers. (Ref.: Chapter 5, Recirc.)

RESOLUTION:

Agree with comment. Credit will be given for any reasonable answer.

QUESTION 2.04

FACILITY COMMENT:

Question should be deleted - Double jeopardy - question 4.11 asks for RWCU isolations.

RESOLUTION:

Disagree with comment. Although questions are similar each asks different things. Question remains unchanged.

QUESTION 2.05

FACILITY COMMENT:

Also accept WR, VP, RCIC, and MSIV isolations as potential answers - Systems Manual 49-27.

RESOLUTION:

Comment confusing. Comment was neither accepted nor denied. All candidates answered question correctly, and clarification of comment was not requested.

QUESTION 2.06

FACILITY COMMENT:

Question asks for 6 of 7 automatic trips. "Manual" was listed as an automatic trip. Is a "Manual" trip an automatic trip? Also, 3 of the trips are electrical protective relay trips. The operator has no direct control over what is going to cause an electrical protective device to trip. He knows there are breaker trips, but shouldn't be tasked with knowing each individual protective device trip. The question really should have asked for 3 trips excluding the manual trip and electrical protective trips.

Question should be graded to accept any 5 correct answers. Also, since a confusion factor was added, points should not be deducted because of a wrong guess on what that 7th auto trip would be.

RESOLUTION:

Disagree with comment. Question asked for the design trips of the feed pump. Although the operator may or may not be able to change or control a protective trip he should be aware of the signals which will trip a piece of equipment under his control. Six out of seven trips were asked for because "Manual" is not an automatic trip. However, since your reference material called it an automatic trip it was listed as such. Credit was given for "Manual" only because the reference material states it as in automatic trip.

QUESTION 2.07

FACILITY COMMENT:

Add 9., Loss of Leak Detection Power System Descrip. 49-14.

RESOLUTION:

Agree with comment. Credit will be given if "Loss of Leak Detection Power" was given as an answer.

QUESTION 2.08

FACILITY COMMENT:

See comments for answer key returned to T. Lang. Also consider Local Manual closure as opposed to Remote Manual.

RESOLUTION:

Agree with comment. Will accept any reasonable answer.

QUESTION 2.08 b.

FACILITY COMMENT:

Accept any breaker trip. Also accept the trip coil fuse.

RESOLUTION:

Agree with comment. Will accept any reasonable answer such as: Neutral overcurrent, Phase overcurrent, Differential overcurrent, etc.

QUESTION 2.10

FACILITY COMMENT:

"Damper" is same as "Vane."

RESOLUTION:

None.

QUESTION 3.01

FACILITY COMMENT:

Answer d. is wrong; no scram occurs. Answer e. is wrong; 1/2 scram - Systems Manual 21-30.

RESOLUTION:

Agree with comment. Answer key changed to show correction.

QUESTION 3.03 a.

FACILITY COMMENT:

Accept - 129" for Level 1
12.5" for Level 3

RESOLUTION:

Agree with comment. Will accept actual set points of level.

QUESTION 3.03 b.

FACILITY COMMENT:

Don't require "Loss of power" for credit. Give credit for any assumed conditions the examinee states which would reset timer in accordance with answer key.

RESOLUTION:

Agree with comment in regards to loss of power; however, disagree with comment regarding accepting any assumed condition. Will not take credit off if answer does not include loss of power to logic channel.

QUESTION 3.04

FACILITY COMMENT:

First of all, this question references the Systems Manual, Chapter 43 - DC Systems - there is no basis for the questions or the answers in this lesson plan.

a. "two methods" is vague. Also accept -
Normal Charger Operation
Alternate Charger Operation (or other unit charger cross tie
or

One charger carrying both unit divisional batteries (both are in "float" then). These are all "methods" of charging batteries.

b. First of all, there is no basis in our lesson plans, procedures, surveillances for this question and answer.

Point 1 - procedures do not address putting chargers in parallel equalize operation.

Point 2 - There is not a reference in our procedures or lesson plans which even mention the "rectifiers" in the battery chargers as limiting components.

Unless this question is deleted, give credit for any answer that deals with procedures, etc., above, or other "reasonable" responses.

RESOLUTION:

Agree with comment in regards to accepting other answers which came from other reasonable interpretation. Credit will be given for other interpretations of "methods" of charging. The basis for question is that there is a D.C. system and its operation should be understood.

QUESTION 3.05 c.

FACILITY COMMENT:

Also accept Tech Spec numbers for SDV rod block and scram -
el.' 765' 5 1/4" Rod Block
el.' 767' 5 1/4" Scram

RESOLUTION:

Agree with comment. Credit will always be given for a correct set point in lieu of a parameter.

QUESTION 3.06

FACILITY COMMENT:

See T. Lang answer key for comments.

RESOLUTION:

Comment only rephrased answer key. Credit will be given as stated.

QUESTION 3.07

FACILITY COMMENT:

a. Type of valve (i.e., pneumatic 3-way valve) should not be required for credit. It was not asked for. Credit should be given for any answer which explains that Service Water Flow through the Stator Cooling Heat Exchanger is controlled to maintain temperature.

b. Type of valve (i.e., pneumatically operated butterfly valve) should not be required for credit. It was not asked for. Credit should be given for any answer which explains that pressure is supplied by the Stator Cooling Pumps, and that a pressure control valve maintains pressure.

RESOLUTION:

Agree with comments. Additional information was in answer key only for clarification, answer was quoted from reference material.

QUESTION 3.08

FACILITY COMMENT:

a. Answer key is wrong. Should be I and IV instead of I and II!

c. We do not and cannot operate in the Regions II and III, where operation is not permitted. The 90 sec. answer is mentioned in the lesson plans, but it is hardly a key point. The 90 sec. appears to have come from a generic generator manual. In regions II and III, the generator is motorized. Our generator is protected by a reverse power trip which will automatically trip off the generator after a short time delay on a reverse power condition. Delete question 3.08 c.

RESOLUTION:

a. Agree with comment. Answer key changed to reflect grading.

c. Deleted from test. Section value dropped by 0.5 points.

QUESTION 3.09 a.

FACILITY COMMENT:

Also accept -

The worth of control rods at the 100% rod line.
and
Imperfect mixing (Systems Manual 10-5, 10-6).

RESOLUTION:

Will accept "Worth of Control Rod" but will not accept imperfect mixing.

QUESTION 4.02

FACILITY COMMENT:

Our operators are trained to operate with conservatism. The important point of this question should be aimed at "Does the operator understand that when a component is placed to PTL is it considered inop?" - not "what is the one existing approved exception to this rule?" - which is what the question is asking for. This question should be deleted because knowing this one exception is hardly worth 8% of this exam section.

The existing question and answer key ask for two conditions when there is really only one condition - when an approved procedure exists which has been approved IAW Tech Specs. At the present time, there happens to be only one example that has been analyzed and approved in this fashion - the Diesel Fire Pumps.

The only other potential time that systems are put into "manual" or "PTL" without immediate regard for automatic operability requirements is under emergency conditions (LGAs) when General precaution #6 allows the operator to place an ECCS component in the MANUAL mode if at least two independent indications confirm "misoperation in the automatic mode" or "adequate core cooling is assured" - LGA Gen. Precautions.

Also, LAP 1600-2 allows taking systems out of normal operational lineup in order to 1) "prevent injury to personnel," 2) minimize "releases offsite," 3) prevent "damage to equipment" - pg. 5, LAP 1600-2.

If question not deleted - consider above possibilities.

RESOLUTION:

Disagree with comment. An operator should know that placing a piece of equipment in PTL will make that equipment inoperable. If the facility places exceptions to the condition then the operator should know exception as well as the rule.

QUESTION 4.03

FACILITY COMMENT:

Also accept the new position "Station Manager" which was recently created in an organizational change.

RESOLUTION:

Agree with comment. Will accept Station Manger as a correct answer.

QUESTION 4.04

FACILITY COMMENT:

Question does not specifically ask for "temperature" limitations. Should accept any start interlocks, i.e,

a. 4 Bkr closed
b. Suc. & Disch. valve closed
c. M/A station in MAN
d. Other RR trips cleared

Systems Chapter 5
Also prerequisites from LOP-RR-04 (attached)

RESOLUTION:

Agree with comment. Will accept any other reasonable answer.

QUESTION 4.06

FACILITY COMMENT:

Also may accept "declare rod inop."

RESOLUTION:

Credit will only be given for answers which agree with answer key.

QUESTION 4.08

FACILITY COMMENT:

Answer key should read "within 24 hours of reaching 15% power."

RESOLUTION:

Comment only rephrased answer key. Will accept either answer.

QUESTION 4.11

Will accept SBLC initiation as a correct answer.

QUESTION 4.12

FACILITY COMMENT:

Gone are the days when an Instrument Tech. can request an NSO to change the mode switch position to test an interlock. If this was to be done today, multiple reviews of this action by SROs, onsite review personnel and Tech Spec experts (Op. Engineer, Shift Engineer, SCRE) would have reviewed and approved

this action using the Tech Spec. With no spec to reference this question, it is not really applicable for an SRO much less an RO candidate. If this action were really to be done, the following reviews would be done:

1. A special test procedure or an LIS or LTS would need to be written and approved by onsite review.

2. The Shift Supervisor would have to approve the test to be done.

3. The SCRE would have to approve the action, since it affects safety-related components.

4. A massive research effort would have been completed since potential actual ESF actuations would need to be jumpered to avoid an unnecessary "red phone" notification to the NRC.

5. The NSO would be instructed to take the action by his supervisor and would probably demand that the supervisor justify exactly what would happen and why.

This question is hardly a Reactor Operator level question. The question deals with a "footnote" to a table of Operational Conditions contained in the definitions section of Tech. Specs. NUREG 1021, page 4 of 4 of ES-402 states that the "...candidate is not expected to memorize the exact details, numbers, and surveillance requirements contained therein." This statement was related to the Tech Specs and their bases. Also, in Generic Letter 82-13 from D. G. Eisenhut, dated June 17, 1982, stated, "...that Tech Spec questions concentrate on understanding of the bases, general knowledge of what actions are required immediately (within one hour) and why, and what systems have Tech Spec limits and why." As this question does not comply with these guidelines, the question is an unfair test question and should be thrown out.

RESOLUTION:

Question deleted. Section point value changed to reflect change.

ATTACHMENT B

RESOLUTION OF COMMENTS TO THE LASALLE SRO EXAM OF 5/20/85

QUESTION 5.02

FACILITY COMMENT:

b. The question does not state as to when during the transient the change in fuel pin centerline temperature should be evaluated. For a depressurization transient such as lowering of the Pressure Set, fuel centerline temperature will initially decrease due to power drop caused by increased voiding. Subsequently, power will increase as EHC responds to decreased reactor pressure. As such, either increase or decrease should be considered as acceptable answers.

c. Question wording is incorrect, and thus misleading for the answer desired. The question should have said, "...exceeded DNB," instead of reaching DNB. DNB, or more correctly, OTB, is defined in the LaSalle Thermal Hydraulics Lesson Plan (74LPSDL, page 9) as "...when a temperature swing (on the cladding surface) of 25°F is detected." These swings will also cause corresponding increases and decreases in fuel pin centerline temperature. Therefore, for the wording used in the question, either increase or decrease, or remains the same should be acceptable.

RESOLUTION:

b. Even if the fuel centerline temperature first decreased and then increased, it would stabilize at a lower temperature so decrease is the correct answer. No change to answer key.

c. As an element reaches DNB the first response of centerline fuel temperature to the steam layer on the clad would be a temperature increase. No change to answer key.

QUESTION 5.03

FACILITY COMMENT:

a. LGP 3-1 does not give specific guidance for soak consideration when interrupting ramp rates. Neither does Lesson Plan 74 LPSDL. LGP 3-1, Power Changes, on page 5 tells the operator:

> "If it is necessary to interrupt the power ramp or soak for a load reduction, the unit may be returned to a higher power level, as recommended by the Nuclear Engineer."

In addition, LGP 3-1 on page 5 also states, "After terminating the load increase, a soak time of 12 hours at the new power level may be required for the fuel to be pre-conditioned at that power level."

"Back-fitting" pre-conditioned envelopes based on previous power ramps during the previous 12 hours is an interpretation of PCIOMR guidelines based on considerable control room experience and in accordance with Nuclear Engineer recommendations. In this light and based on the guidance provided in LGP 3-1, an acceptable alternative answer would be one where the student stated a more conservative pre-conditioned level (such as 11.0 kw/ft) was in effect.

b. This question did not offer a correct answer. The load drop was to 12.0 kw/ft and the question asks for the time to return power to 13.0 kw/ft at 0.1 kw/ft/hr. The correct answer would be 10 hours which is not part of the answers listed.

RESOLUTION:

a. It is felt that a SRO should have a good knowledge of pre-conditioning and how it is accomplished. No change to the answer key.

b. Agree with comment. Examinees were told to put their answer down if no answer was correct so either number 3 or 10 hours will be given credit.

QUESTION 5.09 b.

FACILITY COMMENT:

The question asked only why the reactivity that must be added to achieve prompt critical conditions varies with core life. This is due to the change in Beta fraction over core life. The question does not ask for why Beta fraction changes and thus should not be required for full credit.

RESOLUTION:

The answer key is felt to be an adequate response to "explain why." Anything less will only receive partial credit. No change to answer key.

QUESTION 5.11 a.

FACILITY COMMENT:

Loss of backpressure portion of answers should not be required for full credit. A turbine-driven reactor feedwater pump could experience "run-out" due to a controller failure causing turbine speed to increase drastically. This "run-out" condition is not directly caused by a "loss of backpressure"; therefore, the loss of backpressure should not be required for full credit. Any answer stating that system/pump flow exceeds design considerations should be acceptable.

Other potential adverse consequences of pump run-out exist other than motor electrical damage. Some of these include cavitation, loss of pump cooling, and coupling failure. Attached are pages from a Westinghouse PWR document that describes these possibilities. Therefore, these answers should be counted as acceptable alternative answers to damage to motor windings.

RESOLUTION:

Agree. Answer key changed to reflect this.

QUESTION 6.01 a.

FACILITY COMMENT:

The question asked does not deal with problems associated with having too high of a water level in the downcomer. Instead, the question only asks why we have vacuum reliefs. Therefore, the only answer that should be necessary for full credit is to "...prevent drawing water up into the downcomer as the exhaust condenses from a previous relief." Grading of this question should reflect this.

RESOLUTION:

The answer key is felt to be an adequate response to the question. Anything less will only receive partial credit. No change to answer key.

QUESTION 6.02

FACILITY COMMENT:

Slow closure of the MSIVs during "test" and normal operation is performed by slowing bleeding air pressure off the operating piston and allows spring tension ONLY to close the valve. For this reason, a or c should be acceptable answers. Reference: Main Steam L.P., pages 33-34.

RESOLUTION:

Comment not accepted. Normal operation is considered to be with the control switch for opening or closing the valve. No mention is made in procedures about using the test switch for closing. Answer stays as is.

QUESTION 6.05

FACILITY COMMENT:

Answer "b" is also acceptable as the turbine speed is controlled during normal startup by using the M/A station/EAP in MANUAL greater than 2000 RPM. Reference: LOP-FW-04, Step F.9.

Also for answer "d", the use of the solenoid number "SV-7" causes confusion and is a needless application of detail. The question was intended to ask how handjack operation effects FAP control of the turbine. By listing the solenoid number (which is not used in procedure or panel I.D.) to identify the handjack could confuse the student. As to whether this solenoid must be energized or de-energized has little or no impact on an operator's ability to safely operate the plant. Grading of this question must consider the confusion and irrelevance of this question.

RESOLUTION:

The term startup is normally used to mean for the beginning or in this case zero speed. Therefore, answer d is the correct answer and no change to answer key. The use of the solenoid number came right out of the lesson plans and was used to reduce confusion.

QUESTION 6.06

FACILITY COMMENT:

Also should accept the voltage regulator and governor as separate required auxiliary systems for this question.

RESOLUTION:

Agree. Answer key changed.

QUESTION 6.07

FACILITY COMMENT:

These are not the only high speed permissives. The following should also be counted:

a. 4 Breaker closed
b. Suction and discharged valve closed
c. M/A station in MANUAL
d. Any other RR pump trip signal clear

In addition, 2 of the answer in the key contain multiple interlocks which should be counted separately:

a. FCV position and 30% feedwater are separate interlocks
b. For RPT this can be initiated bv Turbine Control Valve fast closure or Turbine stop valve closure and should be accepted as separate answers.

Ref.: LaSalle System Description, Chapter 5, pages 39 and 46
LaSalle Electrical Schematic 1E-1-4205AR

RESOLUTION:

a, b, and d are not accepted as these are start permissives for slow speed also and are not just high speed permissives. Answer key changed to accept c. Also, agree with the second part of the comment and answer key changed.

QUESTION 6.08

FACILITY COMMENT:

a. Should also accept charging header pressure as an alternate answer. The only time it does not come into play is during scram time testing when the HCU is intentionally isolated from the charging header.

b. Answer #3 should be basically the same as answer #2. LaSalle lesson plans for CRD mechanics and hydraulics do not include the information listed in the answer key. LaSalle Lesson Plan, Chapter 7, page 29 does state:

> "5. Normal scram (accumulator plus reactor pressure). Normal scrams are accomplished using a combination of accumulator and reactor pressures (accumulator pressure at the beginning of the stroke and accumulator plus reactor pressure once the accumulator pressure decays for reactor pressure)."

RESOLUTION:

a. Charging water pressure will be accepted in place of accumulator pressure but not in place of vessel water.

b. The candidate should recognize some distinction between 2 and 3. Reasonable explanations that do recognize these differences will be given credit.

QUESTION 6.09 b.

FACILITY COMMENT:

Valve numbers should not be necessary for full credit.

RESOLUTION:

Agree. Answer key changed.

QUESTION 6.11

#2.b also accept closure of 2, 3 or 4 turbine control valves which will also satisfy the logic.

Ref.: LaSalle Electrical Schematic 1E-1-4215AH

RESOLUTION:

Two valves may not cause scram. Will accept any explanation that shows the equivalent of one out of two twice.

QUESTION 7.05

FACILITY COMMENT:

Tech Spec 3.4.1.1 also requires that the recirculation flow control system is placed in MASTER MANUAL. This should be counted as an acceptable alternate answer. Also for answers d and e - both consist of multiple requirements that should be counted as separate acceptable answers.

RESOLUTION:

Agree. Answer key changed.

QUESTION 7.06

FACILITY COMMENT:

Per T.S. 3.9.2, the following should also be counted as separate acceptable alternate answers:

a. Shorting links removed
b. Continuous indication available in the Control Room

RESOLUTION:

Agree. Answer key changed.

QUESTION 7.07

FACILITY COMMENT:

a. Also acceptable other answers such as use of the full core display, selecting rods and checking the 4 rod display.

   Ref.: LGP 3-2, F.26

b. Also accept that the Mode Switch will provide another alternate scram signal.

   Ref.: LaSalle System Description, Chapter 20, RPS

RESOLUTION:

a. F.26 is completed later in the procedure and is not solely for the purpose of verifying rods are in after a scram. No change to answer key.

b. This is not the reason stated in the procedure. No change to answer key.

QUESTION 7.08

FACILITY COMMENT:

Should also accept other means such as RT rejection and operation, and MS line drains.

RESOLUTION:

Not per procedure. No change to answer key.

QUESTION 7.10

FACILITY COMMENT:

For answer #2, "insert cram arrays" should be sufficient as it is intuitive/generally understood that they are part of CRSP and are selected such that RWM/RSCS won't interfere with rod motion.

Also accept manual scram if feedwater temperature drops 100°F.

Ref.: LOA-FW-01

RESOLUTION:

Agree. Answer key changed.

QUESTION 7.11

FACILITY COMMENT:

Also accept "...prior to rod motion affecting power distribution" in the core.

Ref.: LOA-IN-01

RESOLUTION:

We assume they mean LOA-1A-01. Agree. Answer key changed.

QUESTION 8.02

FACILITY COMMENT:

a. Also accept the following as alternative answers:

   1) Checking "stall flow"
   2) Use of full-out lights to verify coupling
   3) Use of 4 rod display indication - position indication goes blank and then returns during coupling checks

b. For an immovable rod - if it is caused by mechanical interference or excessive friction - each answer should be counted separately.

Also a rod that is movable but not trippable is considered inoperable.

Ref.: T.S. 3.1.3.1

Also for faulty RPIS indication - failure of full-in/full-out switches should be counted as a separate answer from regular RPIS position switches as Tech. Specs. separates actions for these conditions.

Ref.: T.S. 1.3.7

RESOLUTION:

a. One has nothing to do with rod coupling. 2 and 3 are methods of determining overtravel. No change.

b. Agree. Answer key changed plus other answers added.

QUESTION 8.03

FACILITY COMMENT:

a. LAP 900-4 specifies that a temporary lift is an acceptable action for the condition described in the question. The student should only be required to state that a "Temporary Lift" be performed - not describe physically how a temporary lift is performed.

b. Partial clearances of outages as described in answer #1 are authorized by LAP 900-4, page 13. For outages of limited extent, this is a permissible and relatively common occurrence at the station.

RESOLUTION:

Agree to a. Answer key changed. For b #3 is the best answer. No change to answer key.

QUESTION 8.05

Added suppression pool temperature and pressure.

QUESTION 8.07

FACILITY COMMENTS:

The question here deals with a "footnote" to a table of Operational Conditions contained in the definitions section of Tech Specs. NUREG 1021, page 4 of 4 of ES-402 states that the "...candidate is not expected to memorize the exact details, numbers, and surveillance requirements contained therein." This statement was related to the Tech Specs and their bases. Also in Generic Letter 82-13 from D. G. Eisenhut dated June 17, 1982 stated, "...that Tech Spec questions concentrate on understanding of the bases, general knowledge of what actions are required immediately (within one hour) and why, and what

systems have Tech Spec limits and why." As this question does not comply with these guidelines, the question is an unfair test question, and should be thrown out.

RESOLUTION:

Agree. Question deleted.

QUESTION 8.09

FACILITY COMMENT:

Should also accept answers that state that an exception would be when station procedures direct as these procedures are approved IAW Technical Specifications.

RESOLUTION:

Agree. Answer key changed.

QUESTION 8.11

FACILITY COMMENT:

LOP-HP-04 states that "stable and under control" could also mean "...if these parameters are following expected trends." This should also be an acceptable alternate answer.

RESOLUTION:

Agree. Answer key changed.

QUESTION 8.12

FACILITY COMMENT:

A recent change occurred at LaSalle which hasn't been reflected in the Company Rad Standards. Under this change, Operating Supervision may or may not be required to make shiftly reviews of an active (Type 2) RWP depending on the nature of the work. Determination of this review is done by the Shift Engineer/Shift Supervisor during initial RWP approval. Student answers to this procedure should also be acceptable.

Ref.: LAP 100-22, page 2 and 7 (attached)

RESOLUTION:

Agree. Answer key changed.

ATTACHMENT C

RESOLUTION OF COMMENTS TO THE LASALLE LIMITED SRO EXAM OF 6/12/85

QUESTION M.01

FACILITY COMMENT:

Should also accept RHR rejection to radwaste or main condenser during shutdown cooling operation.

Ref.: LOP-RH-07

RESOLUTION:

Accepted. Answer key modified.

QUESTION M.05

FACILITY COMMENT:

Should also accept a description that states there are 2 "zones" of orificing - central and peripheral.

Ref.: LaSalle System Description, Chapter 2, page 24

RESOLUTION:

Not accepted. Question asked for types of orificing. No change to answer key.

QUESTION M.07

FACILITY COMMENT:

Question is a little ambiguous - enrichment variance and poison loading should be acceptable answers.

Ref.: LaSalle System Description, Chapter 4, pages 20-21

RESOLUTION:

Comment accepted. Answer key modified.

QUESTION N.02

FACILITY COMMENT:

Should also accept that the surge tank is designed such that the fuel pool cannot be completely drained and the fuel uncovered by a break in the fuel pool cooling piping.

Ref.: LaSalle System Description, Chapter 66, page 32

RESOLUTION:

This is a fuel pool design and not a purpose of the surge tank. No change to answer key.

QUESTION N.08

FACILITY COMMENT:

The question assumes a water level above +55" but does not state such. Should also accept if says it would initiate on -50".

RESOLUTION:

Do not accept. During actual refueling which is what this license exam is for, water level would be above +55". No change to answer key.

QUESTION N.09

FACILITY COMMENT:

Setpoints should not be included as there is no refuel floor indication for Rx level (in inches) and drywell pressure.

RESOLUTION:

The limited SRO should still have a knowledge of the setpoints even though this is no direct indication of them on the refuel floor. He can obtain the current reading and trend from the control room. No change to answer key.

QUESTION O.01

FACILITY COMMENT:

Also accept use of dummy fuel bundles.

RESOLUTION:

Comment accepted. Answer key modified.

QUESTION O.03

FACILITY COMMENT:

Should also accept Nuclear Materials Custodian as he has a sign-off on LTP-1600-26, Attachment C, Approval Sheet.

RESOLUTION:

Comment accepted. Answer key modified.

QUESTION 0.06

FACILITY COMMENT:

Should also accept other surveillance requirements as question did not specify the same (i.e., signal-to-noise ratio, countrate, etc.).

RESOLUTION:

Accepted. Answer key modified.

QUESTION 0.08

FACILITY COMMENT:

Due to ambiguous nature of the question the second half of the question need not be required for full credit. Either answer should be acceptable.

RESOLUTION:

Comment accepted. Answer by modified.

QUESTION 0.09

FACILITY COMMENT:

Second half of the answer is not asked for by the question and should not be required for full credit.

The question as a whole is very confusing and does not make it clear what answer is being solicited. As such the test weight is a reasonable answer but the fuel shipping cask is not. This confusion is compounded by the use of the term "storage area" which implies the fuel storage racks and may mislead the candidate to search for a non-existent second weight limit. Also the critical "L" path limits the travel of the cask and prevents it from traveling over the spent fuel racks.

RESOLUTION:

First part of the comment is accepted and answer key changed. Second part of comment is not accepted.

QUESTION 0.11

FACILITY COMMENT:

LAP-240-6 and Control of Temporary System Changes are exclusively duties of the Shift Engineer, Unit Shift Foreman holding full SRO licenses. As it is not a duty of the Limited SRO, the question is not valid and should be thrown out.

RESOLUTION:

Comment accepted. Question deleted.

QUESTION P.02

FACILITY COMMENT:

Setpoints should not be required as they are not requested.

RESOLUTION:

Accepted. Answer key modified.

QUESTION P.05

FACILITY COMMENT:

GSEP EAL exact classifications - are not required knowledge of full SRO license holders. The intent is to be able to utilize the EALs to make classifications and to memorize generic GSEP classes and class descriptions not specific EALs. Question should be thrown out. A general knowledge of GSEP should be expected of a fuel handling foreman but not an exact memorization of GSEP Emergency Action Levels.

RESOLUTION:

Comment accepted. Question deleted.

QUESTION Q.03

FACILITY COMMENT:

Use of the cattle chute should also be considered an acceptable answer as it prevents dropping of the fuel bundle which could cause high radiation levels in the drywell.

Page 52 of Chapter 67, System Description

RESOLUTION:

Comment accepted. Answer key modified.

MASTER

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION
LIMITED TO FUEL HANDLING

FACILITY: LASALLE 1

REACTOR TYPE: BWR-GE5

DATE ADMINISTERED: 85/06/12

EXAMINER: DIMMOCK

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
19.00	20.54			M. REACTOR AND FUEL CHARACTERISTICS
16.00	17.30			N. EQUIPMENT, INSTRUMENTATION AND DESIGN DESCRIPTION
~~24.50~~ 22.0	26.49			O. PROCEDURES AND LIMITATIONS
~~16.00~~ 14.0	17.30			P. EMERGENCY SYSTEMS AND SAFETY DEVICES
17.00	18.38			Q. HEALTH PHYSICS AND RADIATION PROTECTION
~~92.50~~ 88.0	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION M.01 (2.00)

During refueling the CRD system will normally be imputting approximately 63 gpm into the reactor well. How is this excess water normally removed? (List two methods) (2.0)

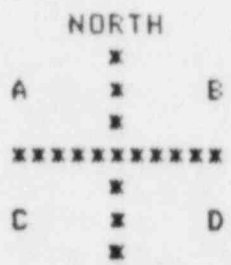
QUESTION M.02 (2.00)

What would be the results of a 1/M plot if the detector was located too close to the source? Explain your answer. (2.0)

QUESTION M.03 (2.00)

Per your core verification procedure LTP 1700-1, what are the four (4) criteria to be used to determine proper fuel element orientation. (2.0)

QUESTION M.04 (.50)



(This represents one fuel cell)

Pick the correct answer concerning fuel element A above:

a) The orientation of element A is Northeast.

b) The orientation of element A is Northwest.

c) The orientation of element A is Southeast.

d) The orientation of element A is Southwest.

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

QUESTION M.05 (3.50)

a) What is the reason for having orificing in fuel support pieces? (2.0)

b) What are the different types of fuel orificing found at Lasalle? (exact size of orifices is not needed.) (1.5)

QUESTION M.06 (1.00)

What is the purpose of the finger springs on the fuel bundles?

QUESTION M.07 (1.50)

What are the three types of fuel rods to be found in a bundle? (1.5)

QUESTION M.08 (1.50)

What are three (3) purposes of the fuel channel? (1.5)

QUESTION M.09 (1.00)

What are two (2) reasons for adding gadolinia to the fuel? (1.0)

QUESTION M.10 (4.00)

a) What is a reactivity coefficient? (1.0)

b) Name the three (3) reactivity coefficients that are of most significance in your reactor? (1.5)

c) Do these coefficients help or hinder control of your reactor? Explain your answer. (1.5)

(***** END OF CATEGORY M *****)

QUESTION N.01 (1.00)

In the event of an accident that drains the reactor vessel during refueling with the fuel pool gates removed, what prevents uncovering the fuel in the storage pool? (1.0)

QUESTION N.02 (3.00)

What are the three purposes for the Skimmer Surge Tanks?

QUESTION N.03 (1.00)

What prevents the fuel pool from draining through the diffuser fill lines in the event that a pump discharge line were to break? (1.0)

QUESTION N.04 (2.00)

Makeup to the fuel pool will occasionally be required due to evaporation.

a. How is water normally made up to the fuel pool? (1.0)

b. What would happen if makeup water was not isolated and the fuel pool continued to fill? (1.0)

QUESTION N.05 (2.00)

What are the 4 types of storage racks located in the fuel pool? (2.0)

QUESTION N.06 (2.50)

The interlock status display module, located in the operator's cab above the console controls, displays a number of indications. What conditions must exist for the following indications? Be sure to include all conditions.

a) Backup Hoist Limit light is on. (1.0)

b) Monorail Auxiliary Hoist Interlock light is on. (1.5)

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

QUESTION N.07 (.50)

Answer True or False. Secondary containment must be broken in order to bring the Fuel Shipping Cask (IF-300) into the reactor building. (.5)

QUESTION N.08 (2.00)

If during refueling, the HPCS system were to get an inadvertent initiation signal (one sensor in each channel), would you expect HPCS to start and inject? Explain your answer. (2.0)

QUESTION N.09 (2.00)

What are the two automatic initiation signals for the LPCS system? Include setpoints. (2.0)

(***** END OF CATEGORY N *****)

QUESTION D.01 (2.00)

When a control rod is not withdrawn from its cell, and fuel movement procedures require that some of the bundles around it be transferred, what must be present in the cell and why? (2 answers necessary) (2.0)

QUESTION D.02 (2.00)

On-shift changes to a Transfer List that do not change the intent of the procedure may be made. What restrictions are there in regards to the changes, and who can make them? (2.0)

QUESTION D.03 (1.50)

The Master Refueling Nuclear Description should be onsite reviewed and approved by what three people after the Nuclear Engineer has prepared it?

QUESTION D.04 (2.00)

On the Nuclear Component Transfer List is a space for the component type code for the component to be transferred. What is the component for each of the following codes:

a. L
b. S
c. CH
d. Blank
e. DA
f. CR
g. BG
h. D

(2.0)

QUESTION D.05 (3.00)

What is the technical specification definition of "core alteration"?

QUESTION D.06 (2.00)

What are the requirements for operable SRM's during refueling? (2.0)

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

QUESTION O.07 (2.00)

What are the prerequisites for fuel storage pool and reactor water level during refueling? (2.0)

QUESTION O.08 (2.00)

What are the requirements for communication between the control room and the refueling platform personnel during core alterations? (2.0)

QUESTION O.09 (2.00)

According to the precautions of LFP-100-1, Fuel handling in the storage area should be limited to one fuel assembly at any time or the weight equivalent per crane. What are the two exceptions to this weight requirement? (2.0)

QUESTION O.10 (3.50)

The limitations and actions section of LFP-100-1 require that secondary containment integrity shall be maintained. What is the Technical Specification definition of secondary containment integrity? (3.5)

DELETE

QUESTION O.11 (2.50)

There are four conditions in which use of a Temporary System change is not required. One of which is "Lifting of Leads to meet Technical Specification Action requirements."

a. What are the other three conditions? (1.5)

b. If the Temporary System Change is to lift leads to meet Technical Specification Action requirements, who must concur? (1.0)

(***** END OF CATEGORY O *****)

QUESTION P.01 (3.00)

Ventilation ducts are located around the perimeter of all three pools, cask well, and transfer canals just above the skimmer weirs.

a. What are the purposes of having the vent ducts located there? (list two) (2.0)

b. What two ventilation systems can this air be routed to? (1.0)

QUESTION P.02 (4.00)

a. What is the purpose of the Critical L Path for the overhead crane? (2.0)

b. How is the Critical L Path put into effect? (0.5)

c. What interlocks are in effect when the crane is in the Critical L Path mode? (1.5)

QUESTION P.03 (4.50)

What are the refueling rod blocks? (4.5)

QUESTION P.04 (2.00)

What is the purpose of the control rod velocity limiter and how does it perform its intended function? (2.0)

QUESTION P.05 (2.00)

DELETE

A fuel handling accident (report of damage to irradiated fuel assemblies and fuel pool exhaust monitor> 100 mR/hr) is listed in your LSCS emergency action levels as one of two classifications, depending on certain plant conditions. What are the two action levels and the plant conditions connected with each? (2.0)

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

QUESTION P.06 (.50)

The Shift Engineer, as initial Station Director, will take immediate action during an emergency and will activate the GSEP Station Group as appropriate. In the Shift Engineer's absence or incapacitation, the line of succession is: (Pick the correct answer)

a) Shift Foreman, SCRE, Fuel handling foreman, NSO(Senior personnel)
b) Shift Foreman, SCRE, NSO(Senior personnel), Fuel handling foreman
c) Shift Foreman, SCRE, NSO(Senior personnel)
d) Shift Foreman, SCRE, Fuel handling foreman

(***** END OF CATEGORY P *****)

QUESTION Q.01 (4.00)

In the design basis for the fuel pool cooling system it is stated that the RHR system will maintain the fuel pool below 150 degrees F in the event of an emergency heat load. What would be the result(s) of the fuel pool exceeding this temperature? Include any consequences of these result(s)? (4.0)

QUESTION Q.02 (1.00)

What is the cause of Cerenkov radiation? (1.0)

QUESTION Q.03 (2.00)

What prerequisites must be met concerning the upper level of the drywell during refueling to insure that excessive exposures to personnel do not occur? (2.0)

QUESTION Q.04 (2.00)

How is normal personnel access to the refueling floor limited during refueling? (Consider during normal refueling operations and not during testing.) (2.0)

QUESTION Q.05 (2.00)

What precautions are taken concerning personnel during:

a) Open vessel subcritical checks? (1.0)

b) Shutdown margin tests, critical checks, and other multiple rod withdrawals with the head removed? (1.0)

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

QUESTION Q.06 (3.00)

What is the definition of:

a) Radiation area? (2.0)

b) High radiation area? (1.0)

QUESTION Q.07 (1.00)

When radiation work involves raising radioactive materials in the fuel pools above established limits, what must be done prior to the work? (1.0)

QUESTION Q.08 (2.00)

Your Radiation Protection Standards, LRP-1000-1 list eight (8) conditions when a worker should leave the controlled area as quickly as possible, consistent with safety. What are four (4) of these? (2.0)

(***** END OF CATEGORY Q *****)

(*************** END OF EXAMINATION ***************)

MASTER

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER M.01 (2.00)

This water is rejected by either the reactor water cleanup system drain flow regulator or the fuel pool cooling reject line to the condensate storage tank. (2.0)

REFERENCE
Fuel Pool lesson plan, pg. 18.

ANSWER M.02 (2.00)

The operator would overpredict the number of fuel bundles necessary to go critical. (Or the reactor would go critical on less bundles than predicted.) This is because most neutrons seen by the detector during the early portion of fuel load are from the source. The neutrons from fuel will have an effect only in the later portions of the graph. (2.0)

REFERENCE
Fuel Handling lesson plan, pg 32.

ANSWER M.03 (2.00)

1. The channel's spring clip is located at the corner of the fuel assembly adjacent to the corner of the control rod. (.5)
2. The boss (protrusion) on the fuel assembly bail points toward the adjacent control rod. (.5)
3. The fuel assembly identification numbers on the fuel assembly bail are all readable from the direction of the center of the control cell. (.5)
4. The fuel channel spacer buttons are on the fuel channel walls adjacent to the control rod. (.5)

REFERENCE
LTP 1700-1, pgs 1-2.

ANSWERS - LASALLE 1 -85/06/12-DIMMOCK

ANSWER M.04 (.50)

c.

REFERENCE
LTP 1700-1, pgs 2 and attachment A.

ANSWER M.05 (3.50)

a) More cooling is required in higher powered bundles. When the two phase flow is increased in a bundle there is more resistance to flow. This tends to reduce the flow in the higher powered bundles and increase the flow in the lower powered bundles. The orifices in the fuel support pieces have a larger pressure drop than the fuel, and therefore any change in pressure drop across the fuel results in insignificant change to the core flow pattern. (2.0)
b)Four lobed central zone orificing, (largest orifices), four lobed peripheral zone orificing, (next largest), and peripheral fuel support orificing. (These are the smallest orifices.)

REFERENCE
Reactor Vessel lesson plans, pgs 22-24 and figure 2-18.

ANSWER M.06 (1.00)

The finger springs maintain a constant bypass flow at the interface of the channel and fuel bundle lower tie plate. (1.0)

REFERENCE
Fuel lesson plan, pg 11.

ANSWER M.07 (1.50)

Tie rods. (.5)
Water spacer capture rods. (.5)
Standard rods. (.5)

REFERENCE
Fuel lesson plan, pg 11.

mention of enrichment variance + power loading will be acceptable if 3 different mentioned

ANSWERS - LASALLE 1 -85/06/12-DIMMOCK

ANSWER M.08 (1.50)

Any 3 at .5 ea.

1. Channels the coolant flow upward through the fuel bundle.
2. Provides a bearing surface for the control rod blades.
3. Provides protection for the fuel rods during fuel handling.
4. Provides the primary resistance to lateral acceleration loading on the fuel assembly.
5. Insures correct control rod passage clearance by the use of stainless steel buttons at the top of the channel.

REFERENCE
Fuel lesson plan, pgs 9-10.

ANSWER M.09 (1.00)

1. To provide reactivity control (extend core life) (.5)
2. Distributed axially to flatten axial power distribution. (.5)

REFERENCE
Fuel lesson plan, pg 19.

ANSWER M.10 (4.00)

a) The change in reactivity associated with a positive unit change in a specified plant parameter. (1.0)
b) Moderator temperature, fuel temperature (Doppler), and voids. (1.5)
c) They help in control of the reactor. Any increase in the measured unit will cause a negative reactivity insertion which will prevent an uncontrolled power excursion. (1.5)

REFERENCE
1LPRT

ANSWERS - LASALLE 1 -85/06/12-DIMMOCK

ANSWER N.01 (1.00)

A slot between the fuel pool and the reactor cavity is only deep enough to permit passage of a fuel bundle when carried by the refueling bridge fuel grapple in the full up position. This assures adequate water coverage of the fuel in the unlikely event that the reactor well is drained without the fuel pool gates in place. (1.0)

REFERENCE
Fuel Pool lesson plan pg. 15.

ANSWER N.02 (3.00)

1. Provide an adequate supply of water to the suction of the fuel pool cooling pumps. (1.0)

2. Act as a surge volume to handle water displaced by the pieces of equipment immersed or removed from pools. (1.0)

3. Filter out any large foreign particles to protect the circulating pumps. (1.0)

REFERENCE
Fuel Pool lesson plan, pg 16.

ANSWER N.03 (1.00)

Each diffuser has a vacuum breaker at the top of the diffuser to prevent siphoning the pool dry if the supply lines break below the pool water level. (1.0)

REFERENCE
Fuel Pool lesson plan, pg. 17.

ANSWER N.04 (2.00)

a. Makeup is manual using the cycled condensate fill valve. (1.0)

b. If overfilled the pools will overflow into the ventilation ducting. (1.0)

ANSWERS - LASALLE 1 -85/06/12-DIMMOCK

REFERENCE
Fuel Pool lesson plan, pg. 33.

ANSWER N.05 (2.00)

1. Fuel storage racks (.5)
2. Defective fuel canisters (.5)
3. Control rod storage racks (.5)
4. Channel storage racks (.5)

REFERENCE
Fuel Handling lesson plan, pg. 15.

ANSWER N.06 (2.50)

a) This lamp lights only if the normal maximum up limit for the main hoist has failed and the hoist has been stopped by the backup maximum up limit. (1.0)

b) When this light is on, the monorail auxiliary hoist will be inoperative. The signal will light whenever the platform is over the reactor and a control rod is withdrawn and a load is on the monorail auxiliary hoist. (1.5)

ANSWER N.07 (.50)

False.

REFERENCE
Primary and Secondary Containment lesson plan, pg 19.

ANSWER N.08 (2.00)

No, injection would not occur. As long as water level remained normal, the high water level interlock (@8, +55.5") would keep the injection valve closed. The pump would start and run on minimum flow. (2.0)

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER N.09 (2.00)

High drywell pressure (+1.69#) and or (1.0)
Low reactor water level (-129") (1.0)

REFERENCE
LPCS lesson plans, pg 12.

ANSWERS - LASALLE 1 -85/06/12-DIMMOCK

ANSWER 0.01 (2.00)

At least two fuel assemblies diagonally adjacent to the rod or a blade guide must be employed to prevent leaving the control blade unsupported. (2.0)

or dummy fuel bundles.

REFERENCE
LTP 1600-26, pg 2.

ANSWER 0.02 (2.00)

Changes involving the reactor may be made under the direction of the On Site Nuclear Observer. Changes not involving the reactor may be made by the Fuel Handling Foreman. (2.0)

REFERENCE
LTP 1600-26, pg 2.

ANSWER 0.03 (1.50)

Tech. Staff Supervisor (.5)
Operating Engineer (.5)
Superintendent (.5)

also accept Nuclear Material Custodian

REFERENCE
LTP 1600-26, pg 2.

ANSWER 0.04 (2.00)

a. LPRM
b. Source
c. Channel
d. Fuel
e. Dummy Assembly
f. Control Rod
g. Blade Guide
h. Dunker (.25 each)

REFERENCE
LTP 1600-26, pg 4.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER 0.05 (3.00)

The addition, removal, relocation or movement of fuel, sources, incore instruments or reactivity controls within the reactor pressure vessel with the vessel head removed and fuel in the vessel. (3.0)

REFERENCE
Technical Specification definition 1.7, pg 1-2.

ANSWER 0.06 (2.00)

At least two source range monitor channels shall be OPERABLE and fully inserted during CORE ALTERATIONS. One of the OPERABLE SRM channel detectors shall be located in the core quadrant where CORE ALTERATIONS are being performed and one shall be located in an adjacent quadrant. (2.0)

REFERENCE
LFP-100-1, pg 2.

ANSWER 0.07 (2.00)

As a minimum, 23 feet of water shall be maintained over the top of active fuel in irradiated fuel assemblies seated in the spent fuel storage pool racks. (1.0)

As a minimum, 22 feet of water shall be maintained over the top of the reactor pressure vessel flange. (1.0)

REFERENCE
LFP-100-1, pg 2.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER 0.08 (2.00)

Direct communication between the control room and the refueling platform personnel shall be demonstrated within one hour prior to the start of and at least once per 12 hours during CORE ALTERATIONS. (1.0)

NOT REQUIRED

Before any fuel assembly or core component is moved, the step on the Nuclear Component Transfer List being performed must be read by personnel on the refuel platform over the continuous communications link to the unit reactor operator in the control room. ~~(1.0)~~

REFERENCE
LFP-100-1, pgs 3 + 6.

ANSWER 0.09 (2.00)

A properly designed fuel shipping container or an overload test weight. Neither of these should ever be suspended above the fuel storage array. NOT REQ'D (2.0)

REFERENCE
LFP-100-1, pg 5.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER 0.10 (3.50)

SECONDARY CONTAINMENT INTEGRITY shall exist when:

a. All secondary containment penetrations required to be closed during accident conditions are either:
   1. Capable of being closed by an OPERABLE secondary containment automatic isolation system, or
   2. Closed by at least one manual valve, blind flange, or deactivated automatic damper secured in its closed position, except as provided in Table 3.6.5.2-1 of Specification 3.6.5.2.

b. All secondary containment hatches and blowout panels are closed and sealed.

c. The standby gas treatment system is OPERABLE pursuant to Specification 3.6.5.3.

d. At least one door in each access to the secondary containment is closed.

e. The sealing mechanism associated with each secondary containment penetration, e.g., welds, bellows or O-rings, is OPERABLE.

f. The pressure within the secondary containment is less than or equal to the value required by Specification 4.6.5.1.a. (3.5)

REFERENCE
T.S. definitions.

ANSWER 0.11 (2.50) DELETE

a. 1. Jumpers and other temporary system changes which are requested for troubleshooting associated with a Work Request. Provided that a properly completed Troubleshooting work sheet requires it put back in a normal configuration.

   2. When leads or fuses are lifted as part of an equipment outage, provided the leads or fuses are replaced when the outage is cleared.

   3. If the "Temporary System Change" is a part of an approved procedure which returns the systems to normal configuration upon completion.

b. Two individuals holding an active SRO license must concur.

REFERENCE
LAP 240-6

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER P.01 (3.00)

a. Evacuate air from directly over the surface of the pools to keep airborne radiation levels to a minimum and to keep the refueling floor relative humidity as low as possible. (2.0)

b. The reactor building ventilation system or the Standby Gas Treatment system. (1.0)

REFERENCE
Fuel Pool lesson plan, pg 18.

ANSWER P.02 (4.00)

a. The Critical L Path is a restricted movement mode of operation for the overhead crane. The purpose is to keep the spent fuel cask from traveling over the spent fuel storage pool and to allow the cask to travel only over structural members that can support a cask drop. (2.0)

b. It is put into effect by a key-operated switch (Normal-Cask) in the crane's cab. (0.5)

c. In the 'cask' mode crane travel is limited to 18.5 FPM.
The spent fuel cask may only be 6' off the refuel floor or traverses by the crane will be prevented.
The bridge/trolley will not operate simultaneously. (1.5)

REFERENCE
Fuel Handling lesson plan, pgs 11,12.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER P.03 (4.50)

A rod block will result whenever any of the following groups of conditions are satisfied.

1) If the mode switch is in start-up and;
   a) The refueling platform is near or over the core, or
   b) If the service platform hoist is loaded. (1.5)

2) If the mode switch is in refuel and;
   a) A second rod is selected for withdrawal when all rods are not full in, or
   b) The service platform hoist is loaded, or
   c) The refueling platform is near or over the core and one or more of the following exist;
      (1) Trolley mounted hoist loaded.
      (2) Frame mounted hoist loaded.
      (3) Fuel grapple loaded. (3.0)

REFERENCE
Fuel Handling lesson plan, pgs 19-20.

ANSWER P.04 (2.00)

Its purpose is to limit the free fall rate of the blade in the event that a control rod should become uncoupled from its drive mechanism. This will limit the rate at which reactivity is inserted into the core, and prevent fuel damage during a rod drop accident. The falling action of the blade creates a large pressure drop across the velocity limiter due to the multiple directional change of flow. The small radial clearances between the velocity limiter and the CRD guide tube also restricts the rate of fall. (2.0)

REFERENCE
CRD Mechanism lesson plan, pg 8.

ANSWER P.05 (2.00) DELETE

It is an ALERT if the standby gas treatment system is operable, (1.0)
or it is a SITE EMERGENCY if standby gas treatment system is NOT operable. (1.0)

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

REFERENCE
LZP-1200-1, pg 11.

ANSWER P.06 (.50)

C

REFERENCE
GSEP plan, section 4.2, pg 6.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER Q.01 (4.00)

Local boiling would occur at a pool outlet temperature of approximately 150 degrees F. The resulting turbulence could knock loose crud and greatly increase pool activity. At higher temperatures the cation resin would break down. This would release activity back into the pool. A later effect would be the release of sulphates which would lead to dissolution of crud from fuel assemblies and increased activity in the pool. In addition, airborne activity would increase because of more evaporation and because radioactive iodine and noble gases would come out of solution rapidly. (4.0)

REFERENCE
Fuel Pool lesson plan, pgs 9-10.

ANSWER Q.02 (1.00)

This light is caused by high speed particles passing through the water at a speed greater than the speed of light in water. (1.0)

REFERENCE
Fuel Handling lesson plan, pg 33.

ANSWER Q.03 (2.00)

The upper level of the drywell must be monitored by Rad Protection or roped off and access prohibited during CORE ALTERATIONS. (2.0)
ALSO INSTALLATION OF CATTLE CHUTE.

REFERENCE
LFP-100-1, pg 3.

ANSWER Q.04 (2.00)

Personnel access to the refueling floor will be limited to a single door at the refuel floor elevation and all remaining doors and elevator access shall be locked. (2.0)

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

REFERENCE
LFP-100-1, pg 3.

ANSWER Q.05 (2.00)

a) All personnel shall remain outside of the line of sight of the core during open vessel subcritical checks. (1.0)

b) During shutdown margin tests, critical checks, and other multiple rod withdrawals, with the head removed, all personnel are prohibited entry to the refueling floor. (1.0)

REFERENCE
LFP-100-1, pg 5.

ANSWER Q.06 (3.00)

a) Any area accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 millilrem, or in any 5 consecutive days a dose in excess of 100 millirem. (2.0)

b) Any area accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem. (1.0)

REFERENCE
LRP 1000-1, pg 8.

ANSWER Q.07 (1.00)

The Radiation-Chemistry Department shall be informed and/or consulted before the fact so that a radiological evaluation can be made. (1.0)

REFERENCE
LRP 1000-1, pg 11.

ANSWERS -- LASALLE 1 -85/06/12-DIMMOCK

ANSWER Q.08 (2.00)

Any four (4) at .5 ea.

a) When instructed or signaled to do so by the Radiation-Chemistry department.
b) Failure or suspected failure of personal protective equipment.
c) Unexpected deterioration of radiological conditions.
d) In the event that the worker's current accumulated dose equivalent status becomes uncertain for any reason or dose equivalent is equal to the exposure authorized for the job.
e) 'Assembly' sirens sound - practice or actual.
f) Completion of work assignment.
g) Injury
h) Unexpected area radiation monitor alarm and the area dose rate is unknown.

REFERENCE
LRP-1000-1, pgs 12 and 13.

Master

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: LASALLE 1

REACTOR TYPE: BWR-GE5

DATE ADMINISTERED: 85/05/20

EXAMINER: LANG,T.

APPLICANT:

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.00			1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
25.00	25.00			2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
25.00	25.00			3. INSTRUMENTS AND CONTROLS
25.00	25.00			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
100.00	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 1.01 (3.00)

Breifly explain or define the following terms:

a. Thermal neutron. (1.0)

b. Reactivity. (If an equation is used in your answer then explain the equation.) (1.0)

c. Transient period. (1.0)

QUESTION 1.02 (3.00) Figure cold shutdown for cont a.

Explain how and why Rod Worth changes for the following conditions.

a. Rod worth of a center rod compared to a peripheral rod. (1.0)

b. Rod worth when plant conditions change from cold to hot at 1% power. (1.0)

c. Rod worth when plant conditions change from hot at 1% power to hot at 100% power. (1.0)

QUESTION 1.03 (1.00)

Which of the following statements best describes the behavior of xenon and samarium.

a. After a reactor scram occurs, xenon concentration initially increases and samarium decreases.

b. After a reactor scram occurs, xenon will eventually decay to a xenon free condition but a samarium free condition will not occur until after the next refueling outage.

c. The xenon and samarium peak concentration following a scram occurs at a time independant of the previous power level.

d. Xenon concentration may increase or decrease when taking the plant from Hot Standby to full power but samarium will always decrease during this transient after the core's equalibrium samarium has been reached.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.04 (1.00)

A moderator is necessary to slow neutrons down to thermal energies. Which of the following is the most correct reason for opreating with thermal instead of fast neutrons.

a. Increased neutron efficiency since thermal neutrons are less likely to leak out of the core than fast neutrons.

b. Reactors operating primarily on fast neutrons are inherently unstable and have a higher risk of going prompt critical.

c. The fission cross section of the fuel is much higher for thermal neutrons than for fast neutrons.

d. Doppler and moderator temperature coefficients become positive as neutron energy increases.

QUESTION 1.05 (1.00)

Which of the following statements best describes the condition known as "Condensate Depression"?

a. Can lead to condensate pump cavitation if condensate depression is too great.

b. Decreases as hotwell level rises.

c. Reduces Rankine cycle efficiency.

d. Increases as condensate temperature increases.

QUESTION 1.06 (1.00)

Which of the following statements most correctly completes the following sentence: Departure from nucleate boiling is the point where,

a. Void fraction equals one.

b. The heat transfer mechanism changes from nucleate boiling to single phase convection.

c. Radiative heat transfer becomes insignificant.

d. The heat transfer rate sustainable with nucleate boiling reaches its maximum.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.07 (1.00)

Which of the following statements is NOT correct concerning decay heat?

a. Is the heat produced by the energy released from the radioactive decay of fission products.

b. Can be determined by the reading on the SRM's when the reactor is shutdown.

c. Is approximately 6% of the total energy released from fission.

d. Is still a significant contributor to the energy in the reactor core for approximately two hours after the reactor has been shutdown.

QUESTION 1.08 (1.00)

Which of the following is NOT one of the four contributors or factors that establish equilibrium xenon?

a. Direct production from fission.

b. Decay of Iodine.

c. Decay of xenon to Sm.

d. Decay of xenon to Cs.

QUESTION 1.09 (1.00)

Figure 1.12 is a representation of how the resonance peaks of U-238 "flatten out" or Doppler broaden as fuel temperature increases. Which of the following are the correct labels for the x and y axes?

a. X is neutron flux, and Y is interaction rate.

b. X is neutron energy, and Y is microscopic capture cross section.

c. X is atom density of U-238, and Y is neutron flux.

d. X is interaction rate, and Y is neutron density.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.10 (1.00)

The ratio of Pu-239 and Pu-240 atoms to U-235 atoms changes over core life. Which of the pairs of parameters listed below are most affected by this change?

a. Moderator temperature coefficient and doppler coefficient.

b. Doppler coefficient and beta.

c. Beta and moderator temperaturer coefficient.

d. Moderator temperature coefficient and neutron generation time.

QUESTION 1.11 (2.00)

A centrifugal pump is operating at 3600 RPM with a pump head of 160 FT. Pump speed is then reduced so that pump head is 100 FT. What is the new pump speed? Show all work.

QUESTION 1.12 (3.00)

Reactor power is being increased on a 50 second period.

a. How long does it take to increase power from 2kw to 1mw? (1.0)

b. What reactivity is associated with the 50 second period? (1.0)

c. What is the Keff during the power increase? (1.0)

QUESTION 1.13 (1.00)

Prior to startup (all rods in) the SRM count rate is 20 CPS and K eff. is 0.96. If the control rods are pulled to give a delta K of +0.035 what count rate on the SRM's could be expected when the period becomes infinite?

a. 40

b. 160

c. 80

d. 120

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.14 (1.00)

Following an auto initiation of RCIC at a pressure of 800 psig., reactor pressure decreases to 400 psig. Assume the RCIC is operating as designed Which of the following statements best describe the parameter changes in the RCIC.

a. The RCIC flow to the reactor increases RCIC pump discharge head remains constant and RCIC turbine speed increases.

b. The RCIC flow to the reactor remains constant, RCIC pump discharge head decreases and the RCIC turbine speed decreases.

c. The RCIC flow to the reactor remains constant, RCIC pump discharge head remains constant and RCIC turbine speed remains constant.

d. The RCIC flow to the reactor decreases, RCIC pump discharge head increases and the turbine speed remains constant.

QUESTION 1.15 (1.00)

Boiling water reactors are designed to have 'under moderated cores'. Which statement BEST describes under moderated?

a. The ratio of moderator to fuel is such that the temperature and void coefficient will both be the same(both positive or both negitive).

b. The ratio of moderator/fuel is such that increasing moderator density increases K eff.

c. The ratio of moderator to fuel is such that the amount of under moderation increases during core life.

d. The ratio of fuel to moderator is such that increasing moderator density will decrease K eff.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.16 (3.00)

Give the effect (Increase, Decrease, or No Change) and the reason for the effect of the following on Critical Power.

a. Increase in reactor pressure. (Include pressures above and below 800 psia. in your answer.) (1.0)

b. Increase in inlet subcooling. (1.0)

c. Increase in coolant flow. (1.0)

(***** END OF CATEGORY 01 *****)

QUESTION 2.01 (2.00)

In regards to the CRD system:

a. How does the on-line flow control valve respond following a scram? (1.0)

b. Breifly explain the operational consequences of the scram inlet valve sticking shut on a scram. Consider the following two situations and the effect(s) on a single CRD HCU mechanism. (1.0

1. At 200 psig. Reactor Pressure.
2. At 800 psig. Reactor Pressure.

QUESTION 2.02 (2.50)

What are five indications you could check to verify Standby Liquid Control initiation? (0.5 each)

QUESTION 2.03 (2.50)

Answer the following in regards to the RPT system, DO NOT confuse it with the ATWS trip.

a. Fill in the following statement :
"The RPT system is required to trip_____from the 60 Hertz power source within 190 msec. after a_____or _____when reactor power is _____%" (1.0)

b. How is a trip due to an overcurrent condition different than an RPT system trip? (0.5)

c. What is the source of the initiating signals for an RPT .(Two required for full credit.) (1.0)

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.04 (1.50)

Answer the following in regards to the RWCU system:

a. Of the signals listed below, which will cause the F004 valve to close? (0.5)

b. Of the signals listed below, which will cause the F001 valve to close? (0.5)

c. Of the signals listed below, which will cause the F033 valve to close? (0.5)

1. NRHX inlet temperature high.
2. SBLC initiation.
3. Low reactor water level.
4. High pressure from the leak detection system.
5. Low pressure downstream of the F033 valve.
6. High pressure downstream of the F033

QUESTION 2.05 (2.00)

The plant is operating at 100% power. APRM channels A and C have failed high. Instrument technicians are investigating while you research Technical Specifications. A plant auxiliary operator wants to shift RPS B power supply to its alternate power supply for training. Would you let him? Explain why or why not. Direct your answer toward system response instead of administrative requirements.

QUESTION 2.06 (3.00)

There are seven(7) automatic trips for the Motor Driven Feedwater Pump listed in your lesson plans. What are six(6) of the seven(7)?

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.07 (4.00)

A spurious group I has occurred.

a. What initiating signals could have been the cause of the isolation? (six of eight required for full credit. Include set points when applicable) (3.0)

b. If the cause of the isolation is reset will the MSIV's automaticly re-open. If not, what must be done to re-open them? (1.0)

QUESTION 2.08 (3.50)

a. LaSalle Station has a power transfer scheme designed to insure power is available to specific equipment. There are three methods of power transfer, one of which is MANUAL. What are the other two methods and how do they perform the transfer? (2.0)

b. What are three forms or types of over current protection at LaSalle which will automaticly open to protect major pump motors? (NOTE: Major motors would be RHR, RBCCW etc. Also, RELAYS WILL NOT BE EXCEPTED AS AN ANSWER) (1.5)

QUESTION 2.09 (2.00)

a. Assuming a recirc loop break has occurred, why does the high drywell pressure signal lock the discharge block valve in the open position? (1.0)

b. Is the suction valve interlocked to close? If the answer is no then exaplain why. (1.0)

QUESTION 2.10 (2.00)

Regarding the Standby Gas Treatment System:

a. How is flow controlled in a SGT train? (1.0)

b. Following completion of a primary containment purge why is secondary air then drawn at a low flow rate through the unit and discharged? (1.0)

(***** END OF CATEGORY 02 *****)

QUESTION 3.01 (2.50)

For each of the following, state whether a ROD BLOCK, HALF-SCRAM, FULL SCRAM, or NO PROTECTIVE ACTION is generated for that condition. NOTE: IF two or more actions are generated, i.e. rod block and a half-scram, state the most severe, i.e. half-scram.

a. APRM B Downscale, Mode Switch in RUN (0.5)
b. 12 LPRM inputs to APRM C, Mode Switch in STARTUP (0.5)
c. Flow Units A and B Upscale (>108% flow), Mode Switch in RUN (0.5)
d. Reactor water level 58", Reactor power 18%, Mode Switch in RUN (0.5)
e. Main Steam Lines B and D ISOLATED, Mode Switch in RUN (0.5)

QUESTION 3.02 (2.00)

If the following alarm where to annunciate:

```
xxxxxxxxxxxxxx
x   APRM     x
x FLOW BIAS  x
x  OFF NML   x
xxxxxxxxxxxxxx
```

a. What would be three (3) possible signals which would cause this alarm to annunciate? (1.5)

b. What if any are the automatic actions associated with this alarm? (0.5)

QUESTION 3.03 (3.00)

a. What are the ADS automatic initiation signals? Be specific in your answer include all setpoints and time delays. (2.0)

b. If the automatic initation signal clears prior to any of the ADS valves opening, will the timer reset? Explain your answer. (1.0)

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.04 (3.00)

In regards to the 125VDC system:

a. What are the two methods of charging the batteries, and when would each method be used? (2.0)

b. It is estimated that it will take 24 hours to recharge the batteries following a capacity test. It is suggested that the charging time can be reduced to 12 hours if both chargers are placed in parallel. Would you permit this operation, explain your answer. (1.0)

QUESTION 3.05 (3.50)

Regarding the RPS system:

a. Indicate weather the solenoids associated with the following valves are energized or de-energized. Assume a SCRAM signal is present.
   1. Pilot Scram Valves. (0.5)
   2. Back Up Scram Valves. (0.5)
   3. Scram Discharge Vent and Drain Valves. (0.5)

b. Within the RPS trip system the pilot scram valves solenoids are devided into 4 groups (8 total). What indication is avalable to the operator that power is available and each group of solenoids is energized? (0.5)

c. What alarms and/or trips are associated with the Scram Discharge water level? Set points required for full credit. (1.0)

d. Specificly, where is (are) the sensor(s) located for the variable "W" in the APRM Scram Set Point formula .66W +50? (0.5)

QUESTION 3.06 (2.00)

You over hear an operator candidate telling a second operator candidate of his superior performance in the NRC simulator exam.

"They gave me a loss of seal water to the circ. pumps and then failed the automatic circ. pump trip on me. It was easy to tell because I had to manually trip the circ. pump. Also, latter on I could not start it with the low flow seal water alarm up, which told me that it was interlocked off.".

What if anything did you find he did correctly or incorrectly? Two answers required for full credit. False assumptions he made will count as answers as well as correct or incorrect actions.

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.07 (2.00)

Both pressure and temperature are maintained in the Stator Cooling System.

a. How is temperature maintained? (1.0)

b. How is pressure maintained? (1.0)

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

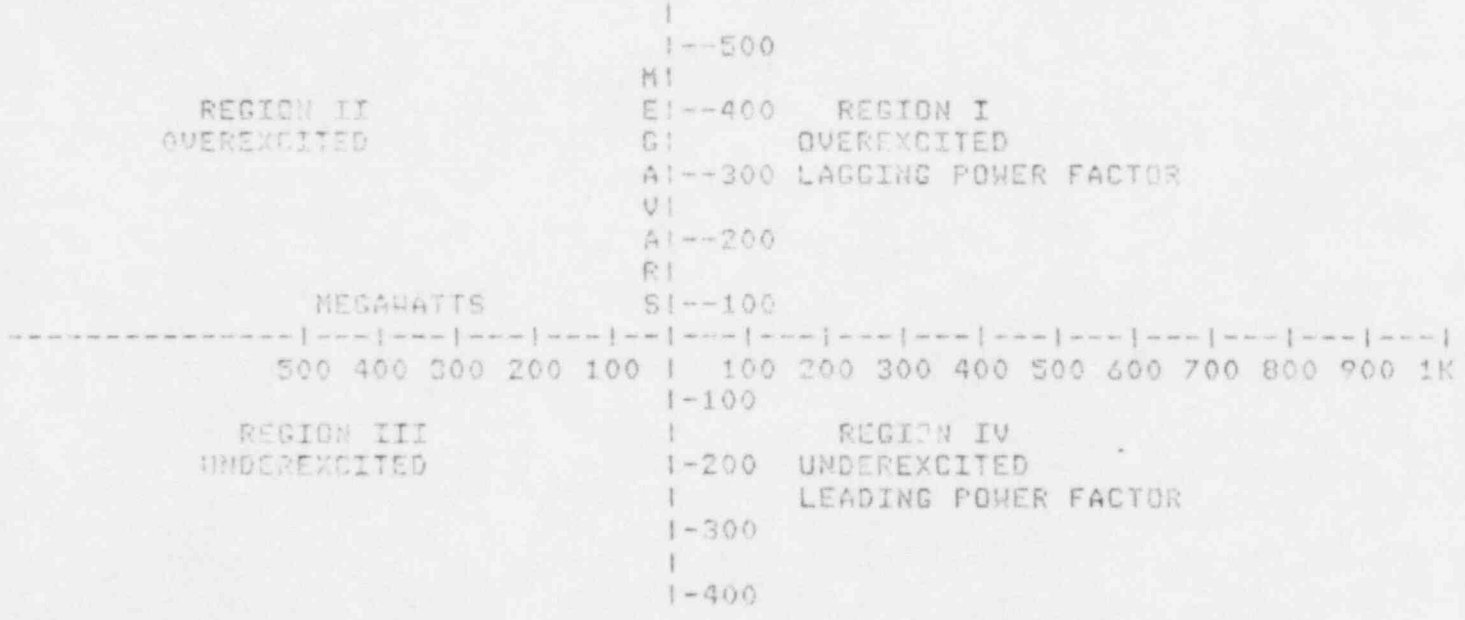
QUESTION 3.08 (2.00)

Using the figure below answer the following questions concerning Generator Excitation.

a. Of the four regions shown on the figure below in what two regions is operation permitted? (1.0)

b. Of the two regions in which operation is permitted, which one would you expect to operate normally? (0.5)

c. How long can you operate in the two regions which operation is NOT permitted? (0.5)



(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.09 (3.50)

a. What are six of the seven positive reactivity effects SBLC must overcome if used at 100% power? (3.0)

b. Initiation of SBLC will automaticly isolate another system. What is this other system? (0.5)

QUESTION 3.10 (1.50)

For the following components in the off gas system signify which are upstream and which are downstream of the holdup volume (30 min.)

a. After filter.
b. Off gas condenser.
c. Electric Reheater.
d. Preheater.
e. Recombiner.
f. Cooler condenser.

(***** END OF CATEGORY 03 *****)

QUESTION 4.01 (2.00)

Which of the following statements are True and which are False in regards to the use of Caution Cards.

a. Caution cards can be used to direct attention to any special condition of an operating system where a hazard to personnel maybe involved.

b. Caution cards can be used to inform personnel that instrument indication requires a correction factor.

c. Caution cards must be authorized by the NSO and logged in the caution card log.

d. Caution cards inform personnel of required notification prior to using equipment.

QUESTION 4.02 (2.00)

Equipment placed in P.T.L., Bypass, or made unable to initiate on an auto initiation signal shall be considered inoperable, except for two conditions. What are the two conditions?

QUESTION 4.03 (3.00)

According to LAP 1100-12 "Control Room Access", unlimited access is allowed to personnel who hold eleven positions.

a. What are eight of these positions? (2.0)

b. Who has the authority to exclude non-essential personnel when their pressence is hampering operations. (1.0)

QUESTION 4.04 (3.00)

a. What are the Limitations for starting an idle Reactor Recirculation pump? (2.0)

b. For two pump operation, the Recirculation Loop Mismatch must be maintained within specific limits. What are these limits? (1.0)

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.05 (1.00)

Select the statement below which best describes the operation of the ECONOMIC GENERATION CONTROL system.

a. Operation of the unit with the EGC system in Automatic flow control is permissible when greater than 65% steam flow.

b. Operation of the unit with the EGC system in Automatic can be done only when the unit is greater than 20% power and core flow less than 65%.

c. The EGC system can be used in Automatic flow control when greater than 20% power and in the range of 65-100% core flow.

d. The EGC system can be used in Automatic flow control between 20% and 55% power.

QUESTION 4.06 (2.00)

What action must be taken when more than one withdrawn control rod has an inoperable scram accumulator?

QUESTION 4.07 (2.00)

Following criticality the NSO is required to notify the L.D. and log four parameters in the unit log book. What are these four parameters?

QUESTION 4.08 (1.50)

a. During a normal unit startup when should the Primary Containment Oxygen concentration be checked? (1.0)

b. What should the concentration be to comply with Tech. Specs.? (0.5)

QUESTION 4.09 (2.00)

Following a scram, you notice that several control rods failed to go full in. What criteria would you use to determine if the injection of SBLC is necessary?

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.10 (2.50)

What are five (5) entry conditions for LGA -03 'Containment Control'? Include set points.

QUESTION 4.11 (2.00)

What are four(4) conditions which will cause the RWCU system to isolate?

QUESTION 4.12 (2.00)

Your reactor is in cold shutdown with all rods full in. Maintenance has just finished working on MSL low pressure interlocks. They ask you to go into 'Run' to verify correct operation of the interlock. Assuming there is no other work in progress, what Tech. Spec. restrictions apply to the mode switch change?

(***** END OF CATEGORY 04 *****)

(********** END OF EXAMINATION **********)

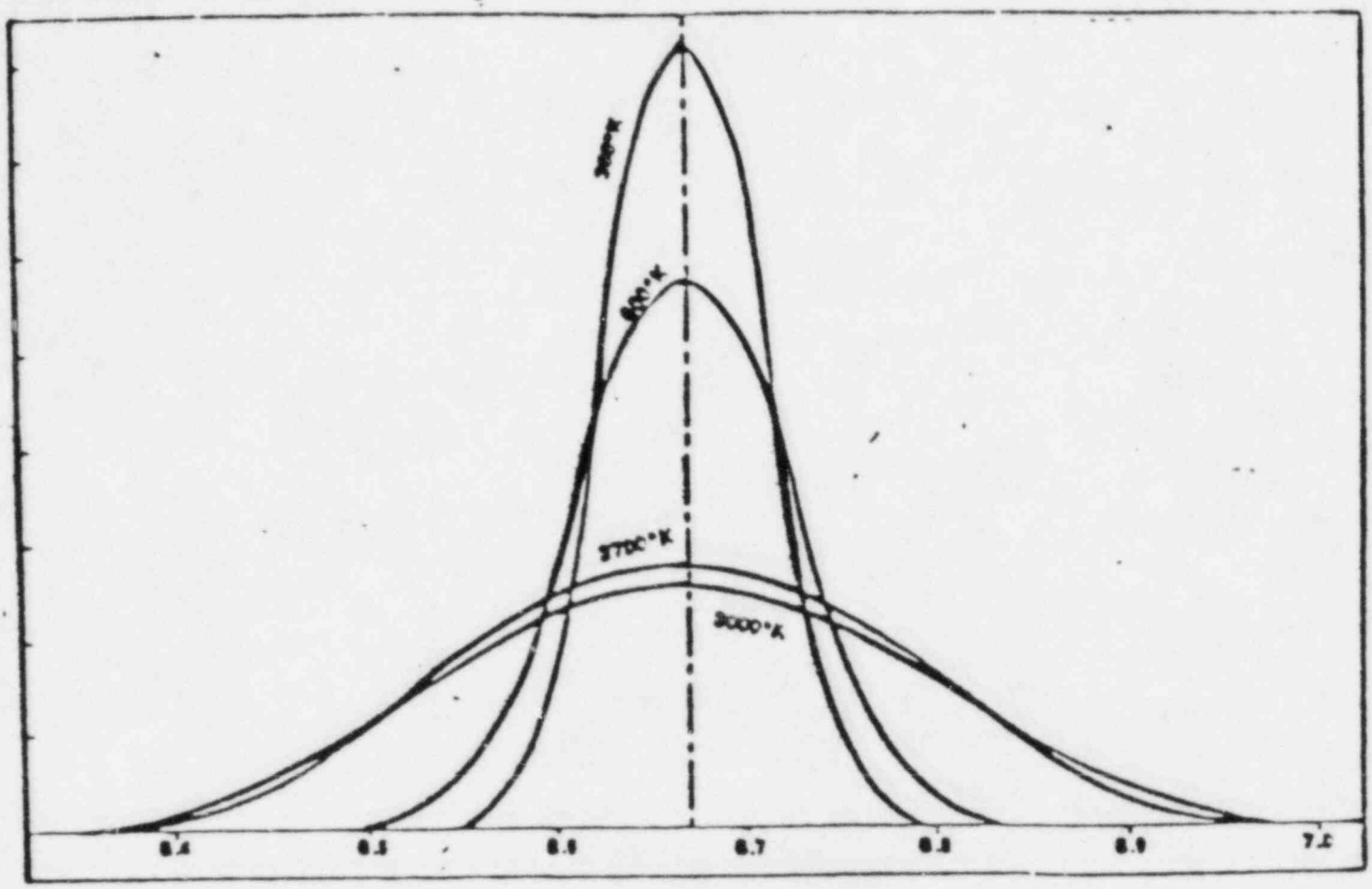


Figure 1.12

Comment Copy

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 1.01 (3.00)

a. Thermal neutrons are neutrons in thermal equalibrium with the atoms in the surronding medium. (1.0)

b. Reactivity simply relates the state of the reactor with respect to criticality or a measure of the deviation from criticality. (1.0)

c. During a control rod withdrawal (or any action changing reactivity) the rate of change of reactivity also effects reactor period. (1.0)

REFERENCE
a. ILPRT page 7
b. ILPRT page 18
c. ILPRT page 30

ANSWER 1.02 (3.00)

a. Control rods at the center of the core are exposed to a higher thermal flux than those at the periphery and therefore have a greater worth. (1.0)

b. As moderator temperature increases, neutron leakage from the fuel cell to the volume around the control rod increases. Thus the control rod is exposed to a higher thermal flux and rod worth increases. (1.0)

c. During operation in this power band void formation occurs. The voids occurring at areas of higher thermal flux depresses the thermal neutron flux peak. Therefore, a control rod in this area is exposed to less flux than it would without voids and the control rod worth decreases. (1.0)

REFERENCE
ILPRT PAGE 43,44

ANSWER 1.03 (1.00)

ans.D

REFERENCE
ILPRT page 56

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 1.04 (1.00)

ans.c

REFERENCE
Standard nuclear principles

ANSWER 1.05 (1.00)

ans.c.

REFERENCE
Standard thermal hydraulic principles

ANSWER 1.06 (1.00)

ans.D.

REFERENCE
Standard nuclear principles

ANSWER 1.07 (1.00)

ans.B.

REFERENCE
Standard nuclear principles

ANSWER 1.08 (1.00)

ans.C.

REFERENCE
Standard nuclear principles

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 1.09 (1.00)

ans.B.

REFERENCE
Standard nuclear principles.

ANSWER 1.10 (1.00)

ans.D.

REFERENCE
Standard nuclear principles.

ANSWER 1.11 (2.00)

flow is proportional to RPM
head is proportional to RPM squared.
power is proportional to RPM cubed.

$$\frac{160 \text{ FT. HEAD}}{(3600 \text{ RPM})^2} = \frac{100 \text{ FT. HEAD}}{(X)^2}$$

$$100(3600)^2 = 160\ X^2$$

$$\frac{100(3600)^2}{160} = X^2$$

$$\sqrt{\frac{100(3600)^2}{160}} = X \quad = 2846 \text{ RPM}$$

REFERENCE
General Theory

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 1.12 (3.00)

a. $P = P_o e^{\frac{t}{T}}$

$t = T \ln(P/P_o)$
$= 50 \ln(ED/1)$
~~$= 345 sec.$~~ 310 sec (1.0)

b. $T = (B-p)/L_p$
$= B/(1+LT)$
$= .0075/(1+(.2)(30))$
$= .0013$ (1.0)

c. $K_{eff} = 1/(1-p)$
$= 1/(1-.0013)$
$= 1.0013$ (1.0)

REFERENCE
General Reactor Theory

ANSWER 1.13 (1.00)

ans.B.

REFERENCE
Standard nuclear principles.

ANSWER 1.14 (1.00)

ans.B.

REFERENCE
Standard nuclear principles.

ANSWER 1.15 (1.00)

ans.B.

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

REFERENCE
Standard nuclear principles.

ANSWER 1.16 (3.00)

a. Between 800 and 1400 psia, as pressure increases critical power decreases. At pressures lower than 600 psia, the affect turns around. CP↑

b. Critical power increases as subcooling increases. Greater amount of subcooling means higher bundle powers before boiling begins.

c. As flow increases critical power increases. As flow increases cooling is improved and critical power increases.

REFERENCE
7410 ODL PAGE 21

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 2.01 (2.00)

(Also accept FCV will close to it most closely position; partially blocked open ≈10%)

a.The flow control will see a high flow and the FCV will close. (1.0)
b.1.Rod will not scram. (0.5)
2.Rod will scram.(0.25)but scram time will be longer.(0.25) (0.5)

REFERENCE
Lesson Plans Control Rod Drive

ANSWER 2.02 (2.50)

1.Squib continuity lamp of explosive valve F004A (F004B) extinguishes indicating that the squibs have received a firing permissive.
2.RWCU system outboard (inboard) isolation valve indicate closed.
3.Pump Starter Energized indicator of the selected pump is illuminated.
4.Tank Shutoff valve F001A (F001B) has opened.
5.Pump discharge pressure increases to approximately 25 psig. above reactor pressure.
6.Storage tank level dropping.
7.Reactor power dropping.

REFERENCE
Lesson Plan SBLC

ANSWER 2.03 (2.50)

a.Both recic. pumps,Turbine Trip,Load Reject,Greater than 30%.
b.RPT has seperate trip coil for each breaker in order to make it safety grade. Also accept that RPT only trip that trips 4 breaker. S-47 ~~Student~~ Systems Manu
c.Turbine Stop Valve Closure or Control Valve Fast Closure.

REFERENCE
Recic. System Lesson Plan pages 36 and 37.

ANSWER 2.04 (1.50)

a.2,3
b.3

(.8) Delete c. - Double jeopardy - Question 4.11 asks for RWCU isolation

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

REFERENCE
RHCU Lesson Plan page 25

ANSWER 2.05 (2.00)

Also - accept All inboard PCIS valves except MSIV's, RCIC, WR and VP close.

No (0.5). When transferring RPS power supplies, the RPS is momentarily deenergized because the transfer is break before make. This would result in a scram due to the 1/2 scram already present (1.5). (2.0)

REFERENCE
RPS Lesson Plan

ANSWER 2.06 (3.00)

Any six(6) for full credit. .5 pts. each.

1. High Reactor Water Level (54.5") 55.5"
2. Low feed pump suction pressure less than 250 psig.
3. Low pump lube oil pressure less than 5psig.
4. [illegible]
5. Phase over-current. } Bkr trip
6. Neutral [illegible]
7. Switch in trip position not "automatic" trip

REFERENCE
LaSalle Lesson Plan, Feedwater System-29-16.

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 2.07 (4.00)

a.Any ~~three~~ Six for full credit.
1.Main steam line high flow. 104%
2.Low reactor water level -50
3.Low MSL pressure with mode switch in Run. 854 lbs.
4.Condenser low vacuum "7"Hg.
5.MSL high rad. 3X normal.
6.MSL tunnel high temperature. 140 deg.
7.MSL high differential temperature. 24 deg.
8.Manual
9. Loss of Leak Detection Power - SEE PCIS Lesson Plan

b.Place the control switches for the inboard and outboard MSIV's in the closed position. and depress the inboard and outboard isolation reset pushbuttons.

REFERENCE
a.PCIS Lesson Plan pages 13 and 14.
b.LOA-MS-02

ANSWER 2.08 (3.50)

a.A fast automatic transfer occurs whenever all source breakers to a bus are open and at least one source is available to the bus at the time the source breakers become open. If more than one source is immediately available the UAT or SAT is given priority. A slow automatic transfer occurs whenever all source breakers to a bus are open. and a fast auto. transfer has not occurred due to all sources not being available to the bus. After the UV relays have tripped the bus breakers feeding motors if a source becomes available after load shed the D/G breaker will close.

b.Breakers.Fuses.Overloads. Automatic or motorized disconnects will also be excepted.

REFERENCE
a.AC distribution lesson plan. page 10.
b.Standard electrical design.

→ Not all required to answer question. Fast transfer - if normal supply lost an alternate supply immediately closes to bus (within 8 cycles)

Slow transfer - normal backup not available and diesel closes in

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 2.09 (2.00)

a. The discharge block valve is interlocked opened to insure that there is an unrestricted blowdown path. (1.0)

b. The suction valve is not interlocked to close because it is not capable of closing against anything greater than 50 lbs. (1.0)

REFERENCE
LaSalle Lesson Plans Recic. System page 26.

ANSWER 2.10 (2.00)

a. With motor operated variable inlet vanes. (or damper) (1.0)

b. To dissipate the decay heat from radioactive contaminants collected in the filters. (1.0)

REFERENCE
LaSalle Lesson Plan CSGT page 13 and 8

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 3.01 (2.50)

a. rod block
b. half-scram
c. rod block
d. full scram — No trip, Scram bypassed below 30%, Chap 20 Fig 20-1, p 20-21,
e. [illegible] — ½ scram, Systems Manual 21-30 - 4
(0.5 each) (2.5)

REFERENCE
Lesson Plan APRM

ANSWER 3.02 (2.00)

a. Upscale >100%
Inop (Module unplugged, Switch not in operate.)
Comparator trip 10% difference in output flow signals. (1.5)

b. Blocks control rod withdrawl. (0.5)

REFERENCE
LOA 1(2) N10-P600 A 200 (Old reference check at facility)

ANSWER 3.03 (3.00)

a. High Drywell Pressure.
Low RX. Water Level (Level 1). (-129")
Low RX. Water Level (Level 3). (+12.5")
Completion of 105 sec. timer.
One RHR or LPCS pump running.

b. Timer will reset on: Accept any one.
1. Loss of power to logic channel. → Not required. Non operational.
2. Reset button depressed.
3. Clearing of any initiation signal within the 105 sec. except for High Drywell Pressure.

REFERENCE
Lesson Plan 200 pages 37-5, 37-9, and 37-10.

Also accept any "assumed" conditions stated by the examinee if the answer coincides

ANSWERS -- LASALLE 1 -85/05/20-LANC,T.

ANSWER 3.04 (2.00)

a. The two methods of charging are Float and Equalize. In Float the batteries receive a trickle charge continuously during normal operation. In Equalize the batteries receive a charge sufficient enough to charge the batteries to their full capacity.

b./c. Battery chargers can be operated in parallel operation for only a short period of time. Parallel operation develops excessive circulating currents between chargers which could damage the rectifiers.

also accept "not designed for parallel op.

REFERENCE
D.C. Systems

ANSWER 3.05 (3.50)

a. 1. De-energized 2. energized 3. de-energized.

b. Each group has power available lights on panel.

c. Rod blocks 24 gal. 765 '5¼" per T.S.
Scrams 48 gal. 767 '5¼" in T.S.

d. Flow restrictors in each recirculation loop. ~~- discharge flow elbow~~

→ also accept recirc suction elbows

ANSWER 3.06 (2.00)

a(i)--Manually tripped the circ water recirculation pumps.
Thought that you could not start up a circulation pump with the low flow alarm up, because it was interlocked off.

Incorrect--- Thought that there was a low seal water trip.

REFERENCE
Circulation Water Lesson Plan.

Any two:

No seal water trip exists - Incorrect

Seal water start interlock - Correct

Manually trip pump - Correct

ANSWERS -- LASALLE 1 -05/05/20-LANG,T.

ANSWER 3.07 (2.00)

a.Temperature is maintained or controlled by a pneumatically operated 3 way valve that regulates the amount of stator cooling water that passes the coolers. – also accept service water flow

→ Valve type not required for credit

b.Pressure is controlled by use of a pneumatically operated butterfly valve that regulates the inlet pressure to the generator.

REFERENCE
Lesson Plan 45-7.

ANSWER 3.08 (2.00)

a.I and II → should be IV !! 46 fig 6, also p46-19 91-20
b.I
c.20 seconds. -reverse power trip (2nd?) → this is in lesson plan but isn't really operationally significant because the generator will trip on reverse power.

REFERENCE
Lesson Plan Generator Excitation and Relaying 46-19.

ANSWER 3.09 (3.50)

a.Decay of rated power xenon inventory
Elimination of voids
Water density from hot to cold
Reduced doppler effect
Reduced neutron leakage
Decreased rod worth as water cools
OR SDM
→ ~~shutdown 100% rod line~~ also accept rods withdrawn to 100% rod line
b.Automatically isolates RWCU system.

REFERENCE
SBLC LESSON PLAN

ANSWER 3.10 (1.50)

a.Downstream.
b.Upstream.
c.Downstream.
d.Upstream.
e.Upstream.
f.Downstream.

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

REFERENCE
OFF GAS LESSON PLAN

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 4.01 (2.00)

ans. a.False,b.True,c.False,d.True.

REFERENCE
LAP 900-12

ANSWER 4.02 DELETE QUESTION (2.00)

a.Diesel fire pump may be considered operable provided an individual is assigned to start the pump when required.

b.Unless the specific equipment is identified in Tech. Specs. - what other equip. is identified in Tech specs.? More research required to answer this.

REFERENCE
LAP 1600-2

ANSWER 4.03 (3.00)

a.Shift Supervisor,Shift Foreman,Superindendent-Asst.Superintendent, Operating Engr.,Tech. Staff Sup.,Region III NRC.,NSO-Station Security, Quality Control,SQA-SCRE also include station Manager (new title for old Station Superintendent

b.Shift Eng.-Shift Foreman,SCRE,NSO.

REFERENCE
LAP 1100-12

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

also accept either start interlocks per LOP-RR-04. Question doesn't specifically call for temperature interlocks.

ANSWER 4.04 (2.00)

a. Idle loop temperature must be within 50 degs. of either the temperature of the coolant in the Reactor when both pumps have been idle or the temperature of the operating loop.

Reactor bottom head drain temperature must be within 145 degs. of the temperature of the coolant in the Reactor Steam Dome.

b. 5% of rated recirculation flow with core flow > or equal to 70% rated core flow.

10% of rated recirculation flow with core flow < 70% rated core flow.

REFERENCE
LOP RR-04

ANSWER 4.05 (1.00)

and "a"

REFERENCE
LOP 2-1

ANSWER 4.06 (2.00)

Immediately verify that at least one CRD pump is operating by inserting at least one withdrawn control rod at least one notch by drive water pressure within normal range or place the reactor mode switch to the shutdown position. (Also accept declare rod INOP)

REFERENCE
LOP 3-1 page 3

ANSWER 4.07 (1.00)

Time, Rod Position, Coolant Temperature, and Reactor Period.

REFERENCE
LOP 1-1

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 4.08 (1.50)

a.24 hours Within reaching 15% thermal power. - Reward "Within 24 hours of reaching 15% power"

b.4% by volume.

REFERENCE
LOP 1-1

ANSWER 4.09 (2.00)

If five (5) or more adjacent rods are not inserted to at least notch position 06 or thirty (30) or more rods are not inserted to notch position 08 and Reactor Vessel Water Level can not be maintained above 12.5" or suppression pool temperature reaches 110 degs.

REFERENCE
LOA NB-08

ANSWER 4.10 (2.50)

a.Suppression pool water temperature >100 degs.
b.Drywell atmosphere temperature >135 degs.
c.Drywell pressure >1.69 psig.
d.Suppression pool water level >+3 (26ft.10in.)
e.Suppression pool water level <-4.5 (6ft.5in.) 26ft 2.5"

REFERENCE
LOA 03

ANSWER 4.11 (2.00)

1.High inlet temperature to RWCU filter-greater than or equal to 140 deg.
2.High area temperature or ventilation differential temperature at the RWCU Recirculation Pumps of Heat Exchangers.
3.High RWCU system differential flow greater than 60 gpm.
4.Low Reactor Water Level

REFERENCE
LOA-RT-01, Page 1

ANSWERS -- LASALLE 1 -85/05/20-LANG,T.

ANSWER 4.12 (2.00)

The reactor mode switch may be placed in the Run or Startup/Hot Standby position to test the switch interlock functions provided that the control rods are verified to remain fully inserted by a second licensed operator or other technically qualified member of the unit technical staff.

REFERENCE
T.S.Table 1.2 'Operational Conditions'.

MASTER

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: LASALLE 1

REACTOR TYPE: BWR-GE5

DATE ADMINISTERED: 05/05/20

EXAMINER: DIMMOCK

APPLICANT:

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.00			5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
25.00	25.00			6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
25.00	25.00			7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
25.00	25.00			8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
100.00	100.00			TOTALS

FINAL GRADE: _____%

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

APPLICANT'S SIGNATURE

QUESTION 5.01 (3.00)

MATCH the appropriate Thermal Limit (a-c),

a. Linear Heat Generation Rate (LHGR)
b. Average Planar Linear Heat Generation Rate (APLHGR)
c. Minimum Critical Power Ratio (MCPR)

to each FAILURE MECHANISM AND to each LIMITING CONDITION given below:

FAILURE MECHANISM	LIMITING CONDITION
F1. Clad melting caused by decay heat & stored heat following a LOCA	L1. Coolant transition boiling
F2. Clad cracking from the surface becoming vapor 'blanketed'	L2. Clad plastic strain < 1%
F3. Clad cracking caused by high stress from pellet expansion	L3. Maximum clad temperature of 2200 deg F

QUESTION 5.02 (2.00)

STATE how fuel pin centerline temperature will change (INCREASE, DECREASE, or REMAIN THE SAME) with each of the following conditions.

a. A 0.001 inch thick layer of corrosion product deposits on the clad surface. (0.5)

b. The Pressure Set on EHC is lowered by 10 psig. (0.5)

c. A fuel bundle reaches DNB. (0.5)

d. A RCIC full flow surveillance is conducted. (0.5)

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.02 (2.00)

Concerning General Electric's Preconditioning Interim Operating Management Recommendations (PCIOMR):

a. Starting with the fuel at a threshold of 11.0 kw/ft, a maximum ramp increase is begun at time 0000 and the final desired power of 13.0 kw/ft is achieved at 2000. At this time, the required soak is performed FOR 10 MINUTES, at which time the load dispatcher directs a power reduction that takes nodal power down to 12.0 kw/ft. SELECT the valid preconditioned value for this node.

ASSUME THE MAXIMUM RAMP RATE IS .10 Kw/ft/hr (1.0)

1) 11.0 kw/ft
2) 11.8 kw/ft
3) 12.5 kw/ft
4) 13.0 kw/ft

b. SELECT the minimum time which would be required to raise power back to 13.0 kw/ft, given the above maximum ramp rate. (1.0)

1) Immediate (Raise to 13.0 kw/ft, w/o restrictions)
2) 5 hours
3) 12 hours
4) 20 hours

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.04 (1.00)

Which of the following statements best describes the operating characteristics of an LPRM detector?

a. Depletion of the detector's Uranium coating causes both the neutron and the gamma sensitivity to DECREASE with detector age; the resulting neutron to gamma signal ratio remains relatively CONSTANT.

b. Since the detector functions as an ionization chamber and the Argon gas pressure remains relatively CONSTANT, BOTH the neutron and the gamma sensitivity, as well as the neutron to gamma signal ratio, remain relatively CONSTANT as the detector ages.

c. Depletion of the detector's Uranium coating causes neutron sensitivity to DECREASE, but has an INSIGNIFICANT effect on gamma sensitivity; this results in a neutron to gamma signal ratio DECREASE as the detector ages.

d. Depletion of the detector's Uranium coating has an INSIGNIFICANT effect on neutron sensitivity, but causes gamma sensitivity to DECREASE; this results in a neutron to gamma signal ratio INCREASE as the detector ages.

QUESTION 5.05 (2.00)

As part of the scram procedure, the operator is directed to insert the SRM's and IRM's.

a. Following a severe LOCA, EXPLAIN how these systems could be used to detect gross core damage. (1.0)

b. EXPLAIN how these systems could be used to provide a crude indication of water level if level could not be confirmed by normal instrumentation. (1.0)

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.06 (1.00)

Which of the following is NOT a characteristic of Subcritical Multiplication?

a. The subcritical neutron level is directly proportional to the neutron source strength.

b. Doubling the indicated count rate by reactivity additions will reduce the margin to criticality by approximately one-half.

c. For equal reactivity additions, it takes longer for the new equilibrium count rate to be reached, as K-eff approaches unity.

d. If ten (10) notches of rod withdrawal increases the SRM count rate by 10 cps, then twenty (20) notches of rod withdrawal will increase the SRM count rate by 20 cps. ASSUME CONSTANT ROD WORTH.

QUESTION 5.07 (2.00)

Following a normal reduction in power from 90 percent to 70 percent with recirculation flow, HOW will the following change (increase, decrease, or remain the same) and WHY:
a. Feedwater temperature. (1.0)
b. Core Xenon concentration (during the first hour). (1.0)

QUESTION 5.08 (2.00)

a) After a reactor scram from power the shortest stable period possible is -80 seconds. Explain this statement. (1.0)

b) Is the initial period immediately following the scram shorter than -80 seconds? Explain your answer. (1.0)

QUESTION 5.09 (2.00)

a) Explain the term "Prompt Critical." (1.0)

b) Explain why the amount of reactivity required to achieve prompt criticality varies with core life. (1.0)

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.10 (1.50)

In the main condenser, circulating water flow rate is many times that of the steam flow rate. Why are these flow rates different? (Primary heat transfer rate equals circulating water heat transfer rate.) (Consider thermodynamic principles in your answer.) (1.5)

QUESTION 5.11 (2.50)

a) What is "pump runout" and why is it an undesirable condition? (1.0)

b) Consider a real plant system(Non-IDEAL) with two identical pumps in parallel, one of which is running. The second pump is started. (Choose the correct answer and explain your choice. Both pumps are operating at 1800 RPM.) The new flow rate will be:

(1) Double the original flow.

(2) Less than double the original flow.

(3) Greater than double the original flow.

(4) Same as original flow, only discharge head changes. (1.5)

QUESTION 5.12 (1.00)

Boiling water reactors are designed to have "under moderated cores". Which statement BEST describes under moderated? (1.0)

a) The ratio of moderator to fuel is such that the temperature and void coefficient will both be the same(both positive or both negative).

b) The ratio of moderator/fuel is such that increasing moderator density increases K eff.

c) The ratio of moderator to fuel is such that the amount of under moderation increases during core life.

d) The ratio of fuel to moderator is such that increasing moderator density will decrease K eff.

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.13 (1.00)

Which of the following is NOT one of the four contributors or factors that establish equilibrium xenon? (1.0)

a) Direct production from fission.

b) Decay of Iodine.

c) Decay of Xenon to Samarium.

d) Decay of Xenon to Cesium.

QUESTION 5.14 (1.00)

T-S diagrams of real plant cycles show a small amount of "condensate depression" (subcooling) in the condenser. How and why would cycle efficiency be affected if subcooling is decreased? (1.0)

QUESTION 5.15 (1.00)

Which of the following statements is correct regarding control rod worth? (1.0)

a) It is proportional to reactor power.

b) It is proportional to rod speed.

c) It is higher in regions of higher relative neutron flux.

d) It is about the same for all rods in the core.

(***** END OF CATEGORY 05 *****)

QUESTION 6.01 (2.50)

A. What is the reason that the safety/relief valve discharge lines are equipped with vacuum relief valves? (1.5)

B. STATE how (INCREASE, DECREASE, REMAIN THE SAME) Drywell Pressure would be expected to respond to an SRV discharge line vacuum relief valve STICKING OPEN during actuation of the SRV. EXPLAIN YOUR CHOICE. (1.0)

QUESTION 6.02 (1.00)

Which one of the following is TRUE regarding the operation of the Main Steam Isolation Valves (MSIV's)?

a. Air pressure is used to normally open the MSIV's and only spring pressure normally will close them.

b. Accumulators supply normal pneumatic pressure for valve operation, with the plant air system providing a backup source.

c. Solenoid valves control the admission of pneumatic pressure to each MSIV, but only ONE solenoid need be energized to keep the MSIV open.

d. On an auto close signal the air is vented from the bottom of the operating piston to the top to allow the valve to close rapidly.

QUESTION 6.03 (3.00)

The plant is operating normally at full power with the FWCS in THREE-ELEMENT CONTROL. One of the main steamline flow inputs into the FWCS fails such that it is inputting zero flow for that steamline.

Assume that the reactor does not scram.

a. After the plant attains a steady-state condition, will the final reactor level be HIGHER, LOWER, or the SAME as initially? (0.5)

b. Explain the responses of the FWCS to this transient. (Include control signal variances and the component responses to these variances.) Be sure to include all the effects. (2.5)

***** CATEGORY 06 CONTINUED ON NEXT PAGE *****

QUESTION 6.04 (1.00)

Which one of the following is a true statement concerning the automatic setback feature of the Reactor Water Level Control system?

a. The setback is initiated as the result of every scram.

b. The setback is automatically reset when the scram is reset.

c. The setback is applied to limit the amount of cold feedwater entering the F.W. nozzles.

d. The setback is applied to prevent excessively high water levels following a scram.

QUESTION 6.05 (1.00)

Reactor Feed Pump (RFP) turbine speed is controlled by either a Motor Speed Changer (MSC) or an Electric Automatic Positioner (EAP). The EAP ...(CHOOSE ONE)

a. ... will control the RFP turbine's speed only if its speed signal is greater than that from the MSC.

b. ...is normally used to control turbine speed during turbine startup.

c. .... unlike the MSC, does NOT have the capability of manual speed control.

d. ...will not control the turbine in automatic if the SV-7 solenoid valve is energized shut.

QUESTION 6.06 (4.00)

a. What are five (5) auxiliary systems which must be in operation for proper operation of the diesel generators? (2.5)

b. During emergency initiation what are the three diesel generator trips still in effect? (1.5)

(xxxxx CATEGORY 06 CONTINUED ON NEXT PAGE xx.xx)

QUESTION 6.07 (2.00)

What are the four (4) high speed permissives that need to be met in order to transfer the recirculation pump speeds from slow to fast? Include setpoints where appropriate. (2.0)

QUESTION 6.08 (2.50)

a. INDICATE the TWO (2) sources of control rod scram hydraulic pressure. (1.0)

b. DISCUSS HOW these two sources (in "a" above) are effective in causing a scram at:

(1) Zero reactor pressure (0.5)
(2) 650 psig reactor pressure (0.5)
(3) 1000 psig reactor pressure (0.5)

QUESTION 6.09 (4.00)

a. Describe the flow path for fuel pool water when the RHR system is being used to assist the fuel pool cooling system. (A drawing may be used but is not necessary) (1.5)

b. During this mode of operation (fuel pool cooling), a relay block must be installed to prevent some automatic function from occurring in the RHR system. What action does this relay prevent? (1.0)

c. List five locations that the RHR pump can discharge to other than the reactor vessel injection nozzles, and the fuel pool cooling system. (1.5)

QUESTION 6.10 (1.00)

What Primary Containment Instrumentation is available for your use on the remote shutdown panel? Give 3 indications and do not include the reactor vessel indications.

(xxxxx CATEGORY 6 CONTINUED ON NEXT PAGE xxxxx)

QUESTION 6.11 (3.00)

For the indicated scrams list the following:

a. Scram signal setpoint
b. Scram logic (or number of initiating events required to cause a scram)
c. When scram is bypassed

Scram signals:
1. Turbine Stop Valve Closure (1.5)
2. Turbine Control Valve Fast Closure. (1.5)

(***** END OF CATEGORY 06 *****)

QUESTION 7.01 (1.50)

The LOA's refer you to LOA-RD-07, Simultaneous Operation of both CRD pumps, as a way to maximize injection into the vessel. If you are using the CRD pumps to maintain level, should you reset the scram? Explain.

QUESTION 7.02 (2.00)

If an ATWS condition exists, when must you start and inject SBLC?

QUESTION 7.03 (1.50)

Regarding LGP 1-1, Normal Unit Startup:

What can be done to minimize feedwater nozzle, sparger, and header thermal hydraulic stress at low feed flow conditions (in lieu of using the feedwater flush line to regulate feedwater header pressure)?

QUESTION 7.04 (2.00)

STATE which LOA (01-05) would have an entry condition of the following: (An answer may be used for more than one condition.)

a. RPV water level less than 12.5" (.5)
b. Suppression pool temperature equal to 105 degrees F. (.5)
c. An isolation condition exists which initiates a reactor scram. (.5)
d. Drywell pressure greater than 1.69 psig. (.5)

QUESTION 7.05 (4.00)

Reactor power operation with ONE recirculation pump is permitted provided that (6) six conditions are met. List four (4) of the six (6) conditions.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.06 (3.00)

What tests or verifications are necessary to demonstrate that each SRM channel is operable prior to and during core alterations?

QUESTION 7.07 (2.00)

According to your REACTOR SCRAM procedure, LGP 3-2:

a. What two methods are to be used to verify that all rods are fully inserted? (1.0)

b. What is the reason for placing the Mode Switch to Shutdown immediately following the scram? (1.0)

QUESTION 7.08 (2.00)

Per the startup to hot standby procedure, LGP 1-2, what four (4) methods may be used for pressure control once pressure has been reached?

QUESTION 7.09 (1.00)

Select the statement below which best describes the operation of the ECONOMIC GENERATION CONTROL system.

a. Operation of the unit with the EGC system in Automatic flow control is permissible when greater than 65% steam flow.

b. Operation of the unit with the EGC system in Automatic can be done only when the unit is greater than 20% power and core flow less than 65%.

c. The EGC system can be used in Automatic flow control when greater than 20% power and in the range of 65-100% core flow.

d. The EGC system can be used in Automatic flow control between 20% and 50% power.

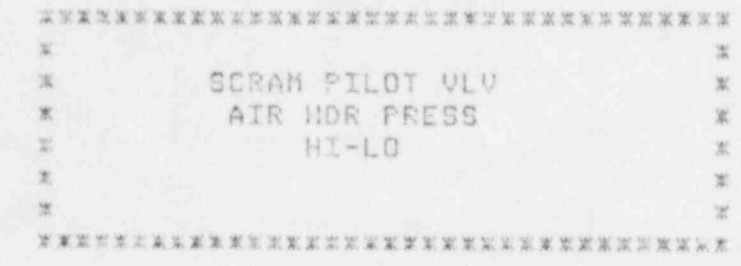
(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.10 (4.00)

a. On a loss of feedwater heaters, what two (2) actions are the operator directed to take to lower reactor power? (2.0)

b. What is the reason for each of these actions? (2.0)

QUESTION 7.11 (1.00)



The above alarm has just annunciated. Under what conditions is a manual scram required? (1.0)

(***** END OF CATEGORY 07 *****)

QUESTION 8.01 (1.00)

Unit 1 is in COLD SHUTDOWN during a reactor startup with no outstanding deficiencies. Drywell and Suppression Chamber Hydrogen Recombiner A becomes INOP. It is anticipated that repairs will be complete within twenty-four (24) hours.

The Shift Supervisor determines that the required action(s) per the Unit 1 Technical Specifications is(are) ... (CHOOSE ONE)

a. ...Operational Condition 4 must be maintained (Entry into Operational Condition 5 is acceptable)

b. ...Startup activities may continue; Operational Condition 3 may be entered, but not exceeded.

c. ...Startup activities may continue; Operational Condition 2 may be entered, but not exceeded; Oxygen concentration shall be maintained < 2 v/o.

d. ...Startup activities may continue; Operational Condition 1 and/or 2 may be entered, but the Recombiner must be returned to an OPERABLE status within 30 days.

NOTE: APPLICABLE TS's ARE ENCLOSED FOR REFERENCE

QUESTION 8.02 (4.00)

a. What are the two methods to be used to insure that a control rod is coupled to its drive? (1.0)

b. What are six (6) conditions which would cause a control rod to be considered inoperable per the Technical Specifications? (3.0)

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.03 (2.00)

a. Is it necessary to clear an entire outage if a test on a single component that is part of that outage is to be performed? Explain your answer. (1.0)

b. A maintenance foreman wishes to clear his turbine outage except for the MSIV's which are closed and tagged out of service for others as well as himself. Select the statement below which best describes the action which should be taken. (1.0)

1. Pull all cards except for the Master and the out of service cards on the MSIV's.
2. Pull all cards except for the ones on the MSIV's, write a new outage and hang a new master.
3. Pull all the cards and hang a new outage on the MSIV's.
4. Transfer the cards hung on the MSIV's to one of the other foreman and clear the remainder of the outage.

QUESTION 8.04 (2.50)

There are four conditions in which use of a Temporary System change is not required. One of which is "Lifting of Leads to meet Technical Specification Action requirements."

a. What are the other three conditions? (1.5)

b. If the Temporary System Change is to lift leads to meet Technical Specification Action requirements, who must concur? (1.0)

QUESTION 8.05 (2.50)

According to LAP 1600-2 "Conduct of Operations"; Operators are not to rely solely on reactor vessel water level indications for manual actions during transients. Besides using all redundant and over-lapping level instrumentation and level alarms, other parameter indications should be used. What are five (5) of these other parameters that should be used.

(XXXX CATEGORY 08 CONTINUED ON NEXT PAGE XXXXX)

QUESTION 8.06 (2.00)

When reactor power is greater than or equal to 25% of rated thermal power and when reactor power has been increased by more than 15% of rated thermal power and steady-state operating conditions have been re-established, what 4 items must be verified to be within Tech Spec limits? (2.0)

QUESTION 8.07 (2.00)

DELETE

Your reactor is in cold shutdown with all rods full in. Maintenance has just finished working on the low pressure interlocks. They ask you to go into "Run" to verify correct operation of the interlock. Assuming there is no other work in progress, what Tech. Spec. restrictions apply to the mode switch change?

QUESTION 8.08 (1.50)

a. During a normal unit startup when must the Primary Containment Oxygen concentration be verified within T.S. limits? (1.0)

b. What should the concentration be to comply with Tech. Specs.? (0.5)

QUESTION 8.09 (2.00)

Equipment placed in P.T.L., Bypass, or made unable to initiate on an auto initiation signal shall be considered inoperable, except for two conditions. What are the two conditions?

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.10 (2.00)

Which of the following statements are True and which are False in regard to the use of Caution Cards.

a. Caution cards can be used to direct attention to any special condition of an operating system where a hazard to personnel may be involved.

b. Caution cards can be used to inform personnel that instrument indication requires a correction factor.

c. Caution cards must be authorized by the NSO and logged in the caution card log.

d. Caution cards inform personnel of required notification prior to using equipment.

QUESTION 8.11 (2.00)

Per your administrative procedures, when are the conditions of 'stable and under control' considered to exist? (2.0)

QUESTION 8.12 (1.50)

What must be done at the beginning of each shift in regard to Radiation Work Permits and who has the responsibility for this? (1.5)

(***** END OF CATEGORY 08 *****)
(********** END OF EXAMINATION **********)

3/4.0 APPLICABILITY

LIMITING CONDITION FOR OPERATION

3.0.1 Compliance with the Limiting Conditions for Operation contained in the succeeding Specifications is required during the OPERATIONAL CONDITIONS or other conditions specified therein; except that upon failure to meet the Limiting Conditions for Operation, the associated ACTION requirements shall be met.

3.0.2 Noncompliance with a Specification shall exist when the requirements of the Limiting Condition for Operation and associated ACTION requirements are not met within the specified time intervals. If the Limiting Condition for Operation is restored prior to expiration of the specified time intervals, completion of the ACTION requirements is not required.

3.0.3 When a Limiting Condition for Operation is not met, except as provided in the associated ACTION requirements, within 1 hour action shall be initiated to place the unit in an OPERATIONAL CONDITION in which the Specification does not apply by placing it, as applicable, in:

1. At least STARTUP within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

Where corrective measures are completed that permit operation under the ACTION requirements, the ACTION may be taken in accordance with the specified time limits as measured from the time of failure to meet the Limiting Condition for Operation. Exceptions to these requirements are stated in the individual Specifications.

This specification is not applicable in OPERATIONAL CONDITION 4 or 5.

3.0.4 Entry into an OPERATIONAL CONDITION or other specified condition shall not be made unless the conditions for the Limiting Condition for Operation are met without reliance on provisions contained in the ACTION requirements. This provision shall not prevent passage through OPERATIONAL CONDITIONS as required to comply with ACTION requirements. Exceptions to these requirements are stated in the individual Specifications.

3.0.5 When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered OPERABLE for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation provided: (1) its corresponding normal or emergency power source is OPERABLE; and (2) all of its redundant system(s), subsystem(s), train(s), component(s) and device(s) are OPERABLE, or likewise satisfy the requirements of this specification. Unless both conditions (1) and (2) are satisfied, within 2 hours action shall be initiated to place the unit in an OPERATIONAL CONDITION in which the applicable Limiting Condition for Operation does not apply by placing it, as applicable, in:

1. At least STARTUP within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

This specification is not applicable in OPERATIONAL CONDITION 4 or 5.

CONTAINMENT SYSTEMS

3/4.6.6 PRIMARY CONTAINMENT ATMOSPHERE CONTROL

DRYWELL AND SUPPRESSION CHAMBER HYDROGEN RECOMBINER SYSTEMS

LIMITING CONDITION FOR OPERATION

3.6.6.1 Two independent drywell and suppression chamber hydrogen recombiner systems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With one drywell and/or suppression chamber hydrogen recombiner system inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.6.6.1 Each drywell and suppression chamber hydrogen recombiner system shall be demonstrated OPERABLE:

a. At least once per 92 days by cycling each flow control valve and recirculation valve through at least one complete cycle of full travel.

b. At least once per 6 months by verifying, during a recombiner system functional test:

1. That the heaters are OPERABLE by determining that the current in each phase differs by less than or equal to 5% from the other phases and is within 5% of the value observed in the original acceptance test, corrected for line voltage differences.

2. That the reaction chamber gas temperature increases to 1200 ± 25°F within 2 hours.

c. At least once per 18 months by:

1. Performing a CHANNEL CALIBRATION of all recombiner operating instrumentation and control circuits.

2. Verifying the integrity of all heater electrical circuits by performing a resistance to ground test within 30 minutes following the above required functional test. The resistance to ground for any heater phase shall be greater than or equal to 100,000 ohms.

d. By measuring the leakage rate:

1. As a part of the overall integrated leakage rate test required by Specification 3.6.1.2, or

2. By measuring the leakage rate of the system outside of the containment isolation valves at P_a, 39.6 psig, on the schedule required by Specification 4.6.1.2 and including the measured leakage as a part of the leakage determined in accordance with Specification 4.6.1.2.

STEAM TABLE

PROPERTIES OF SATURATED STEAM AND SATURATED WATER (TEMPERATURE)

Temp F	Press. psia	Volume, ft³/lb			Enthalpy, Btu/lb			Entropy, Btu/lb x F			Temp F
		Water	Evap	Steam	Water	Evap	Steam	Water	Evap	Steam	
		v_f	v_{fg}	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	
32	0.08859	0.01602	3305	3305	-0.02	1075.5	1075.5	0.0000	2.1873	2.1873	32
35	0.09991	0.01602	2948	2948	3.00	1073.8	1076.8	0.0061	2.1706	2.1767	35
40	0.12163	0.01602	2446	2446	8.03	1071.0	1079.0	0.0162	2.1432	2.1594	40
45	0.14744	0.01602	2037.7	2037.8	13.04	1068.1	1081.2	0.0262	2.1164	2.1426	45
50	0.17796	0.01602	1704.8	1704.8	18.05	1065.3	1083.4	0.0361	2.0901	2.1262	50
60	0.2561	0.01603	1207.6	1207.6	28.06	1059.7	1087.7	0.0555	2.0391	2.0946	60
70	0.3629	0.01605	868.3	868.4	38.05	1054.0	1092.1	0.0745	1.9900	2.0645	70
80	0.5068	0.01607	633.3	633.3	48.04	1048.4	1096.4	0.0932	1.9426	2.0359	80
90	0.6981	0.01610	468.1	468.1	58.02	1042.7	1100.8	0.1115	1.8970	2.0086	90
100	0.9492	0.01613	350.4	350.4	68.00	1037.1	1105.1	0.1295	1.8530	1.9825	100
110	1.2750	0.01617	265.4	265.4	77.98	1031.4	1109.3	0.1472	1.8105	1.9577	110
120	1.6927	0.01620	203.25	203.26	87.97	1025.6	1113.6	0.1646	1.7693	1.9339	120
130	2.2230	0.01625	157.32	157.33	97.96	1019.8	1117.8	0.1817	1.7295	1.9112	130
140	2.8892	0.01629	122.98	123.00	107.95	1014.0	1122.0	0.1985	1.6910	1.8895	140
150	3.718	0.01634	97.05	97.07	117.95	1008.2	1126.1	0.2150	1.6536	1.8686	150
160	4.741	0.01640	77.27	77.29	127.96	1002.2	1130.2	0.2313	1.6174	1.8487	160
170	5.993	0.01645	62.04	62.06	137.97	996.2	1134.2	0.2473	1.5822	1.8295	170
180	7.511	0.01651	50.21	50.22	148.00	990.2	1138.2	0.2631	1.5480	1.8111	180
190	9.340	0.01657	40.94	40.96	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190
200	11.526	0.01664	33.62	33.64	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200
210	14.123	0.01671	27.80	27.82	178.15	971.6	1149.7	0.3091	1.4509	1.7600	210
212	14.696	0.01672	26.78	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212
220	17.186	0.01678	23.13	23.15	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220
230	20.779	0.01685	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230
240	24.968	0.01693	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240
250	29.825	0.01701	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250
260	35.427	0.01709	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260
270	41.856	0.01718	10.042	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270
280	49.200	0.01726	8.627	8.644	249.17	924.6	1173.8	0.4098	1.2501	1.6599	280
290	57.550	0.01736	7.443	7.460	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290
300	67.005	0.01745	6.448	6.466	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300
310	77.67	0.01755	5.609	5.626	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310
320	89.64	0.01766	4.896	4.914	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320
340	117.99	0.01787	3.770	3.788	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340
360	153.01	0.01811	2.939	2.957	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360
380	195.73	0.01836	2.317	2.335	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380
400	247.26	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400
420	308.78	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420
440	381.54	0.01926	1.1976	1.2169	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440
460	466.9	0.0196	0.9746	0.9942	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460
480	566.2	0.0200	0.7972	0.8172	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480
500	680.9	0.0204	0.6545	0.6749	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500
520	812.5	0.0209	0.5386	0.5596	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520
540	962.8	0.0215	0.4437	0.4651	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540
560	1133.4	0.0221	0.3651	0.3871	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560
580	1326.2	0.0228	0.2994	0.3222	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580
600	1543.2	0.0236	0.2438	0.2675	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600
620	1786.9	0.0247	0.1962	0.2208	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620
640	2059.9	0.0260	0.1543	0.1802	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640
660	2365.7	0.0277	0.1166	0.1443	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660
680	2708.6	0.0304	0.0808	0.1112	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680
700	3094.3	0.0366	0.0386	0.0752	822.4	172.7	995.2	0.9901	0.1490	1.1390	700
705.5	3208.2	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	705.5

EQUATION SHEET

$f = ma$

$v = s/t$

$s = V_o t + 1/2\ at^2$

$w = mg$

$E = mc^2$

$KE = 1/2\ mv^2$

$a = (V_f - V_o)/t$

$PE = mgh$

$w = \theta/t$

$V_f = V_o + at$

$NPSH = P_{in} - P_{sat}$

$\dot{m} \alpha\ \rho AV$

$\Delta E = 931\ \Delta m$

$Q = \dot{m} C_p \Delta t$

$Q = UA\Delta h$

$Pwr = W_f \Delta h$

$P = P_o 10^{sur(t)}$

$P = P_o e^{t/T}$

$SUR = 26.06/T$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$

$T = (\ell^*/\rho) + [(\beta - \rho)/\lambda\rho]$

$T = \ell/(\rho - \beta)$

$T = (\beta - \rho)/(\lambda\rho)$

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

$\rho = [(\ell^*/(T\ K_{eff})] + [\beta_{eff}/(1 + \lambda T)]$

$P = (\Sigma_\phi V)/(3 \times 10^{10})$

$\Sigma = \sigma N$

$NPSH = \text{Static head} - h_L - P_{sat}$

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.

Cycle efficiency = (Network out)/(Energy in)

$A = \lambda N$

$A = A_o e^{-\lambda t}$

$\lambda = \ell n 2/t_{1/2} = 0.693/t_{1/2}$

$t_{1/2}^{eff} = [(t_{1/2})(t_b)]\ [(t_{1/2}) + (t_b)]$

$I = I_o e^{-Ex}$

$I = I_o e^{-\mu x}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$HVL = -0.693/\mu$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 10^{-5}$ seconds

$\lambda = 0.1\ \text{seconds}^{-1}$

$I_1 d_1 = I_2 d_2$

$I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$

$R/hr = (0.5\ CE)/d^2 (\text{meters})$

$R/hr = 6\ CE/d^2\ (\text{feet})$.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)

MASTER

5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 5.01 (3.00)

F1. b
F2. c
F3. a
L1. c
L2. a
L3. b (.50 each)

REFERENCE
74LPSDL pgs 20, 26, and 30

ANSWER 5.02 (2.00)

a. INCREASE
b. DECREASE
c. INCREASE
d. REMAIN THE SAME

REFERENCE
Standard Thermodynamic theory.

ANSWER 5.03 (2.00)

a. 2
b. 3 (Or, as appropriate for answer given in (a))

REFERENCE Answer should have been 10 hours. 3 or 10 hours will be given credit
74 LPSDL, pgs 42 + 43.

ANSWER 5.04 (1.00)

c

REFERENCE
LPRM lesson plan pg 13-15

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 5.05 (2.00)

a. By observing the Full-in and Full-out travel lights (the operator could determine if geometric distortion had occured. Inability to conduct full detector movement would indicate that internal misconfiguration had occured). (1.0)

b. By observing the neutron level while moving the nuclear instrumentation. A significantly HIGHER (approximately 300 times) count rate would be seen for the UNVOIDED areas of the core as opposed to the VOIDED. (1.0)

REFERENCE
SRM lesson plans and Standard Nuclear Theory.

ANSWER 5.06 (1.00)

d

REFERENCE
Standard Nuclear Theory

ANSWER 5.07 (2.00)

a. DECREASES due to less extraction steam from the turbine to heat the feedwater (1.0)
b. INCREASES due to burnout decreasing while production by Iodine is still at higher power rate (1.0)

REFERENCE
Standard Reactor Theory.

ANSWER 5.08 (2.00)

a) After the initial prompt drop, power cannot decrease faster than the longest lived delayed neutron appears. (1.0)

b) Yes. The initial drop in power will only be due to the prompt neutrons. (1.0)

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

REFERENCE
Standard Nuclear Theory.

ANSWER 5.09 (2.00)

a) The reactor is said to be prompt critical when the reactivity addition exceeds the delayed neutron fraction Beta, and is thus critical on prompt neutrons alone. (1.0)

b) Beta decreases with the buildup of Pu-239. (1.0)

REFERENCE
Standard Nuclear theory.

ANSWER 5.10 (1.50)

Circulating water is maintained subcooled while the steam undergoes a change in phase. The heat removal required to condense the steam (i.e., latent heat of condensation) accounts for the large difference in flow rates. (1.5)

REFERENCE
Standard thermodynamics.

ANSWER 5.11 (2.50)

a) Increase in flow due to loss of backpressure. (or the accepted answer) The increased flow causes the motor to draw more current and possibly damage the motor windings. a cavitation, loss of pump cooling, a complete damage (1.0)

b) (2) (.5)
When delivering water into a piping system that offers frictional resistance two pumps operating in parallel will encounter greater resistance to flow. The resistance lowers the total flow to less than twice the original flow. (1.0)

REFERENCE
Standard fluid flow.

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 5.12 (1.00)

b

REFERENCE
Standard Nuclear theory.

ANSWER 5.13 (1.00)

c

REFERENCE
Standard Nuclear theory.

ANSWER 5.14 (1.00)

Cycle efficiency would be increased by a decrease in subcooling. As less heat is rejected to the condenser, the returning condensate requires less reactor heat to produce steam. Therefore cycle efficiency will increase. (1.0)

REFERENCE
Standard Thermodynamic principles.

ANSWER 5.15 (1.00)

c

REFERENCE
Standard Nuclear theory.

ANSWERS -- LASALLE 1 -85/05/20-DIMNOCK

ANSWER 6.01 (2.50)

A. To prevent drawing water into the line as the exhaust condenses from a previous relief. Water a few feet up the discharge line could inhibit the relief discharge and cause damage due to water hammer. (1.5)

B. INCREASE. The vacuum breaker provides a direct path to the Drywell. (1.0)

REFERENCE
Main Steam System Lesson Plans, 21-7,8.

ANSWER 6.02 (1.00)

C

REFERENCE
Main Steam System lesson plans, pg 21-33.

ANSWER 6.03 (3.00)

Level would be the same. (.5)

Since measured steam flow is less than feedwater flow, an error signal is generated which tends to decrease RFP speed. A lower vessel level generates an opposite error signal which tends to increase RFP speed. The integral portion of the Dynamic Compensator (exact term not necessary) will reset its output up until the level error returns to zero. This will return level to its original setpoint. (2.5)

REFERENCE
Reactor Water Level Control lesson plan, pgs 31-9-14

ANSWER 6.04 (1.00)

A

REFERENCE
Reactor Water Level Control lesson plan pg. 31-13

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 6.05 (1.00)

d

REFERENCE
Feedwater lesson plan 29-8-12

ANSWER 6.06 (4.00)

a. 1. Fuel oil and transfer system 2. Air start system 3. Lube oil system 4. Cooling water system 5. Ventilation system. 4. Control power. or governor a voltage regulator Any 5 @ .5 ea

b. 1. Engine overspeed 2. Generator differential current 3. Emergency stop pushbutton. 3 @ .5 ea

REFERENCE
Diesel Generator and Auxiliaries lesson plan.

ANSWER 6.07 (2.00)

1. Reactor Water level > 12.5' (0.5)

2. Feed flow > 30% and FCV at minimum position. (can be 2 answers) (0.5)

3. > 10.1 degree F temperature differential between steam and pump suction. (0.5)

4. RPT not actuated. TCV or TSV (can be 2 answers) (0.5)

REFERENCE
Recirculation System lesson plan. M/G station in manual

any 4 at .5 ea

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 6.08 (2.50)

a. CRD accumulator pressure (.5)
Vessel water (.5)

b. 1. At low reactor pressure, the vessel has minimal effect and scram is accomplished only by the accumulator. (.5)

2. As the vessel pressure rises, the accumulator is assisted on the upper end of the stroke by reactor pressure. As water is forced from the accumulator, accumulator pressure falls below reactor pressure and causes the ball check valve to open allowing reactor pressure to complete the scram. (.5)

3. By 1000#, the accumulator is not necessary and reactor pressure will provide enough hydraulic pressure to meet scram insertion times. Although the accumulator does help start the drive. (.5)

REFERENCE
Control Rod Drive lesson plan

ANSWER 6.09 (4.00)

a. Water flows from the fuel pool to the skimmer surge tanks, through a removable spool piece to the suction of the "B" RHR pump. Then through the "B" RHR HX (or bypass valve), through a removable spool piece back to the fuel pool through its own diffuser. (1.5)

b. Prevents tripping of the "B" RHR pump when both F004B and F006B are closed. Valve numbers not needed (1.0)

c. Suppression pool(min flow and test line)
suppression pool sprays
recirc loops
main condenser
radwaste(via RBCCT)
head spray
drywell(containment) spray any 5 @ .3 ea

REFERENCE
RHR and Fuel Pool Cooling System lesson plans.

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 6.10 (1.00)

Any 3 for full credit. 1/3 point ea.
Suppression Pool level
Suppression Pool temperature
Drywell Pressure
Drywell temperature

REFERENCE
Remote Shutdown Panel lesson plan.

ANSWER 6.11 (3.00)

1. a. 5% closure (.5)
   b. 3 valves (or logic drawing) (.5)
   c. < 30% power or (1st stage pressure <140 psig) (.5)

2. a. < 500 psig trip oil press low (RETS) (.5)
   b. one out of two twice logic (.5)
   c. < 30% power or (1st stage pressure < 140 psig) (.5)

REFERENCE
RPS lesson plan

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 7.01 (1.50)

No, the scram should not be reset, because doing so would close the scram valves causing a greater restriction to flow into the reactor vessel.

REFERENCE
LGP 3-2

ANSWER 7.02 (3.00)

If five (5) or more adjacent rods are not inserted to at least notch position 06 or thirty (30) or more rods are not inserted to at least notch position 06 AND reactor vessel water level cannot be maintained above +12.5" or suppression pool temperature reaches 110 degrees F.

REFERENCE
LOA NO-02

ANSWER 7.03 (1.50)

Manually throttle the FRV inlet stop (FW003) and maintain the RWCU return flow as high as possible.

REFERENCE
LGP 1-1

ANSWER 7.04 (2.00)

a. Level Control (01)

b. Containment Control (03)

c. Level Control (01)

d. Level Control (01), and Containment Control (03)

REFERENCE
LGA's

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 7.05 (4.00)

a. The steady state thermal power doesn't exceed 50% of rated.

b. The Minimum Critical Power Ratio (MCPR) Safety Limit (T.S. 2.1.2) and Operating Limit (T.S. 3.2.3) are increased by 0.01.

c. The MAPLHGR limits are reduced by a factor of 0.85.

d. The APRM flow-biased scram and rod block setpoints are reduced by 5.8%.

e. The APRM flow noise is not greater than 5% peak-to-peak and core plate d/p noise is not greater than 1 psi peak-to-peak (T.S. 3/4.4.1.1).

f. RR pump drive flow in the active loop does not exceed 30375 GPM (75%)

3 MASTER manuals any 4 @ 1.0 ea

REFERENCE
LOP 1-1, pg 7

ANSWER 7.06 (3.00)

a. A channel functional test (7 days) and channel check (12 hrs) must be run. (.75)

b. Verifying that the SRM count rate is at least .7 cps or 3.0 cps if signal to noise ratio is less than 2:1. (.75)

c. Verifying that a detector of an operable SRM is located in the core quadrant where core alterations are being performed and one operable SRM channel is located in an adjacent quadrant and that the detectors are fully inserted. (.75)

REFERENCE
LFP 100-1

per T.S 3.9.2 Shorting links removed during SD negative demonstrate operation CR withdrawn (.75)

Continuous indication available in C.R.

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 7.07 (2.00)

a. Rod Sequence Control Matrix (.5)
Computer program OD-7 (.5)

b. To prevent an isolation when reactor pressure decreases to 854 psig. (1.0)

REFERENCE
LGP 3-2

ANSWER 7.08 (2.00)

1. Control rods .5 each
2. RCIC - but do not inject
3. Steam condensing mode of RHR
4. Relief valves may be manually operated

REFERENCE
LGP 1-2

ANSWER 7.09 (1.00)

ans. 'c'

REFERENCE
LGP 3-1

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 7.10 (4.00)

a. 1. Reduce total core flow approximately 5 x 10^6 lb/hr for every 10 degrees F that the feedwater temperature drops. (1.0)

2. Insert CRAM arrays (per the Control Rod Sequence package if allowed by the rod worth minimizer/Rod Sequence Control System.) (1.0)

( ) not needed for credit

b. Reactor Recirculation flow is reduced to limit power rise in the lower core region to help maintain PCIOMR limits to prevent cladding damage. (1.0)

The CRAM arrays are inserted to clear any APRM Hi's that may have come in OR they are inserted to lower bulk reactor power to offset the reactivity addition due to the colder feedwater. (1.0)

also scram if FW temp ↓ 100°F.

REFERENCE
LOA-FW-01

ANSWER 7.11 (1.00)

If multiple rod drifts/screams are experienced, SCRAM the reactor,

or prior to rod motion affecting power distribution

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER P.01 (1.00)

b

REFERENCE
Lasalle TS, 3.0.4, 3.6.6.1

ANSWER 8.02 (4.00)

a. 1. During normal operation a check is to be made for proper nuclear instrument response to movement. (0.5)
2. When fully withdrawn the operator will attempt to withdraw to the overtravel position. (0.5)
b. 1. Immovable rod 2. Scram insertion time, from full out to Notch 5, greater than (seconds) * 3. Uncoupled rod 4. More than one accumulator inoperative, the associated control rods are inoperative. 5. One or more rod position indications inoperative. 6. Accumulator inop > 8 hours, control rod inop. 7. Slower than average rods in a 4 by 4 array when the array average is less than allowable. Any 6 @ .5 ea

* allowable

overall as 50 V rods INOP 5 could be 2 different ones full in/full out via regular position switches

ANSWER 8.03 (2.00)

a. No. All personnel protection cards, the Master Out of Service card and all necessary out of service cards on the equipment to be tested must be pulled. The remaining cards can stay in place.

"Temporary lift"

b. 3

REFERENCE
LAP 900-4

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 8.04 (2.50)

a. 1. Jumpers and other temporary system changes which are requested for troubleshooting associated with a Work Request. Provided that a properly completed Troubleshooting work sheet requires it put back in a normal configuration.

2. When leads or fuses are lifted as part of an equipment outage, provided the leads or fuses are replaced when the outage is cleared.

3. If the "Temporary System Change" is a part of an approved procedure which returns the syustems to normal configuration upon completion.

b. Two individuals holding an active SRO license must concur.

REFERENCE
LAP 240-6

ANSWER 8.05 (2.50)

Reactor pressure
Steam flow
Feedwater flow
Drywell temperature
Drywell pressure
Drywell radiation levels
Neutron flux indication

Also accept supp pool TEMP + PRESS any 5 @ .5 ea

REFERENCE
LAP 1600-2, pg 6

ANSWER 8.06 (2.00)

APLHGR
APRM rod block and scram setpoint adjustment
MCPR
LHGR

REFERENCE
LCP 1-1

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 8.07 (2.00) delete

The reactor mode ~~switch~~ may be placed in the Run or Startup/Hot Standby position to test the switch ~~interlock~~ functions provided that the control rods are verified to remain fully inserted by a second licensed operator or other technically ~~qualified~~ member of the unit ~~technical~~ staff.

REFERENCE
T.S.Table 1.2 "Operational Conditions".

ANSWER 8.08 (1.50)

a.24 hours after reaching 15% thermal power.

b.4% by volume.

REFERENCE
LGP 1-1

ANSWER 8.09 (2.00)

a.Diesel fire pump maybe considered operable provided an individual is assigned to start the pump when required.

b.Unless the specific equipment is identified in Tech. Specs.

REFERENCE a per approved procedures (same)
LAP 1600-2

ANSWER 8.10 (2.00)

ans. a.False,b.True,c.False,d.True.

REFERENCE
LAP 900-12

ANSWERS -- LASALLE 1 -85/05/20-DIMMOCK

ANSWER 8.11 (2.00)

1. If the radiation levels and the pressure and temperature in the primary containment are stable. (1.0)

2. If there is adequate core cooling as indicated by stable reactor coolant system pressures, temperatures and levels. (1.0)

a following expected trends.

REFERENCE
LAP-1600-2, pg 5

ANSWER 8.12 (1.50)

The Shift Engineer or the respective operating unit supervisor shall read and sign all active RWP's when he begins his shift. (1.5)

a reference to new RWP procedure.

REFERENCE
LRP 1000-1, pg 15