

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-002/OL-89-01

Docket No. 50-002

License No. R-28

Licensee: Michigan Memorial Phoenix Project
University of Michigan
Ann Arbor, Michigan

Facility Name: Ford Nuclear Reactor

Examination Administered At: University of Michigan

Examination Conducted: Week of October 30, 1989

Chief Examiner: *D. Shepard*
D. Shepard
Date 11/13/89

Approved By: *M. Jordan*
M. Jordan, Chief
Operator Licensing Section 1
Date 11/13/89

Examination Summary

Examination administered during the week of October 30, 1989 (Report No. 50-002/OL-89-01) to five reactor operators and one senior reactor operator candidates.

Results:

Three reactor operator candidates passed the examinations.

REPORT DETAILS

1. Examiner

D. Shepard, Chief Examiner

2. Exit Meeting

An exit meeting was held with R. R. Burns (Reactor Manager), G. Cook (Assistant Manager for Operations), and the Chief Examiner on November 2, 1989. No generic concerns were raised. The facility examination comments were discussed as noted in Enclosure 2.

Enclosure 2

Facility Comments and NRC Resolution
of Comments

QUESTION A.01 (1.00)

Which ONE of the following is correct concerning the effects of increasing the moderator to fuel ratio?

- a. Thermal utilization factor increases.
- b. Resonance escape probability decreases.
- c. Reproduction factor increases.
- d. Fast fission factor increases.

ANSWER:

- a.

FACILITY COMMENT:

None of the answers provided is correct. As moderator to fuel ratio increases, thermal utilization factor decreases because the additional moderator is an absorber that competes with fuel for neutrons. The question should be removed from the examination.

NRC RESOLUTION:

Concur, question deleted.

QUESTION A.02 (1.00)

Which ONE of the following is correct with respect to voids?

- a. An increase in the void concentration decreases K_{eff} due to a decrease in the fast fission factor.
- b. An increase in the void concentration increases K_{eff} due to an increase in the resonance escape probability.
- c. A decrease in the void concentration decreases K_{eff} due to an decrease in the fast non-leakage probability.
- d. A decrease in the void concentration increases K_{eff} due to an increase in the thermal utilization factor.

ANSWER:

d.

FACILITY COMMENT:

None of the answers provided is correct. As void concentration decreases, moderator to fuel ratio increases. Thermal utilization factor decreases because the additional moderator is an absorber that competes with fuel for neutrons. The questions should be removed from the examination.

NRC RESOLUTION:

Concur, question deleted.

QUESTION A.08 (1.00)

Which ONE of the following power levels is the highest power level at which the reactor can be operated while in the natural convection mode (assume all systems operate as designed)?

- a. 1 watt
- b. 10 kw
- c. 100 kw
- d. 1 MW

ANSWER:

b.

FACILITY COMMENT:

Every licensed operator including myself missed this question when we reviewed the examination. After the fact, we realized that the scram setpoint is 100 kw so the reactor could not be operated at that level. This question is a trick that has no operations importance. We object to such questions when everyone knows the power limit in natural convection is 100 kw. The question should be removed from the examination.

NRC RESOLUTION:

Question deleted. Do not concur that the question was a trick question. It did require using more than one piece of information to be synthesized vice rote recall. In the multiple choice format for a question to be effective, it is required to use synthesis and the higher cognitive levels of knowledge. The question is deleted since it is possible for the thermal power to be 100 kw and not cause a scram due to movable detectors. Assumption must be made that setpoint is per technical specifications.

QUESTION A.18 (1.00)

Which ONE of the following is closest to the reactor period expected after 20 seconds, if a rod was inserted with a reactivity of -0.005 delta K/K?

- a. -0.995 minutes
- b. -8 seconds
- c. -48 seconds
- d. -80 seconds

ANSWER:

d.

FACILITY COMMENT:

A reactivity insertion of -0.005 delta K/K is a substantial amount of reactivity; about $1-1/2$ of our control rod. While the final stable period following the insertion would be -80 seconds, it would take about three minutes to reach that value which is the time needed for all delayed neutron precursors except Br-87 to decay away. During the transition, the period would vary from short to the final value of -80 seconds; the exact value after 20 seconds would be difficult to precisely determine. Answers a. and c. would be closer to the actual value than answer d. Either answers a., c., and d. should all be accepted or the question should be eliminated.

NRC RESOLUTION:

Concur, question deleted. An experiment done by the facility resulted in a period of -65 seconds as discussed in the exit meeting.

QUESTION A.19 (1.00)

The doppler is NOT significant for the FNR because of the . . .

- a. . . . plate type fuel that is used.
- b. . . . small amount of U-238 in the fuel.
- c. . . . control rod configurations.
- d. . . . low operating power levels.

ANSWER:

b.

FACILITY COMMENT:

The answer is correct, but we do not have any mention of doppler and doppler coefficient in our training material. Our trainees cannot be held responsible for material that is not part of our program. At the last examination, we were told that there would never be another doppler question on one of our examinations. Delete the question from the examination.

NRC RESOLUTION:

This question was deleted due to low safety significance. It should be noted, however, that the knowledge elicited by this question was provided in your training material (Introduction to Nuclear Reactor Operations, Page 4-6, "the effect (doppler) is not seen in the FNR because of the very low uranium density in the fuel . . .")

QUESTION B.10 (1.00)

Which ONE of the following rooms would a 50 R/hr Ion Chamber be found?

- a. 1030L
- b. 2036
- c. 205i
- d. 2105

ANSWER:

c.

FACILITY COMMENT:

We do not require our operators to memorize room numbers. The correct answer is the emergency closet. We request that you eliminate the question. If you will not do that, at least accept answers b. and c. because we could reasonably expect the operators to know the emergency closet is on the second floor of the building.

NRC RESOLUTION:

Concur, question deleted.

QUESTION C.12 (1.00)

Using the attached figure 13.1, which ONE of the following sets of conditions must be met to withdraw A shim safety rod (assume all other requisite conditions associated with the rod withdrawal are met)?

LIGHTS	41 shim range	31 shim upper	40 B mag	36 lower
a.	OUT	LIT	LIT	OUT
b.	OUT	LIT	LIT	LIT
c.	LIT	OUT	OUT	LIT
d.	LIT	OUT	LIT	OUT

ANSWER:

c.

FACILITY COMMENT:

The correct answer is d. Answer c. is incorrect because it specifies that light 40, A shim rod magnet contact light, is out. If that were the case, the rod would not be in contact with its magnet and would not withdraw when the rod drive mechanism was moved. Answer d. is a normal operating condition for withdrawing A rod. Withdrawal permit is actuated because A rod is in shim range. A rod is not in its upper limit and we have magnet contact.

Enclosure 2

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NRC RESOLUTION:

Concur, answer key modified to accept d. as the correct answer.