

Unit 8 - Week 6:Reactor Control

Course outline

How does an NPTEL online course work?

Week 0 : Prerequisite

Week 1: Fundamentals of Nuclear Power

Week 2 : Radioactivity and nuclear Reactions

Week 3 : Nuclear Fission

Week 4:Chain Reaction in Reactors

Week 5 : Reactor Thermalhydraulics

Week 6:Reactor Control

Lec 1:Prompt & delayed neutrons

Lec 2:Delayed neutron kinetics

Lec 3:Different control mechanisms & various effects

Quiz : Assessment 6

Feedback form

Week 7:Thermal Reactors

Week 8:Breeder Reactors

Week 9:Nuclear Fusion

Week 10:Biological Effects of Radiation

Week 11:Reactor Safety & Security

Week 12:Waste Management

Text Transcripts

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Assessment 6

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-11, 23:59 IST.

1) Prompt lifetime for a thermal neutron increases with 1 point

- reduction in neutron energy level
 decrease in fuel utilization factor
 increase in absorption mean free path
 all of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
all of the above

2) Photoneutrons are produced through which of the following reactions? 1 point

- (n, p)
 (γ, p)
 (γ, n)
 (α, n)

No, the answer is incorrect.
Score: 0

Accepted Answers:
 (γ, n)

3) Which of the following activities cannot be performed without using the control rods? 1 point

- emergency shutdown
 planned shutdown
 reactivity adjustment with ageing
 axial offset control

No, the answer is incorrect.
Score: 0

Accepted Answers:
emergency shutdown

4) The material for control rod must have 1 point

- high capture cross-section
 high scattering cross-section
 high fission cross-section
 high inelastic cross-section

No, the answer is incorrect.
Score: 0

Accepted Answers:
high capture cross-section

5) Cd-113 is less preferred to B-10 as the material for control rod because of 1 point

- its lack of compatibility with uranium
 its large resonance peaks
 its lesser absorption capability at the thermal level
 its sharp decline in cross-sections in the $1/V$ region

No, the answer is incorrect.
Score: 0

Accepted Answers:
its large resonance peaks

6) Individual reactivity of any control element is 1 point

- positive
 negative
 zero
 dependent on concentration

No, the answer is incorrect.
Score: 0

Accepted Answers:
negative

7) Use of chemical shim affects the 1 point

- fast fission factor
 thermal fission factor
 resonance escape probability
 thermal utilization factor

No, the answer is incorrect.
Score: 0

Accepted Answers:
thermal utilization factor

8) Presence of burnable absorbers 1 point

- reduces number of control rods & concentration of boric acid.
 reduces number of control rods, but requires higher initial concentration of boric acid.
 reduces initial concentration of boric acid, but required larger number of control rods.
 increases both the number of control rods & concentration of boric acid.

No, the answer is incorrect.
Score: 0

Accepted Answers:
reduces number of control rods & concentration of boric acid.

9) When the turbine load on a BWR, characterized by negative void reactivity coefficient, increases, it experiences 1 point

- an increase in the void production
 an increase in overall temperature level of the system
 an increase in the recirculation flow
 a reduction in overall thermal efficiency

No, the answer is incorrect.
Score: 0

Accepted Answers:
an increase in the recirculation flow

10) Multiplication factor for an initially-critical reactor increases by 0.1%. If it employs U-235 for fission, its reactivity in dollar units is _____ cents.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.153,0.155

11) The resonance escape probability of a certain natural uranium (density = 19.1 g/cc) fuelled reactor is 0.878 at 300 K. The fuel rods are 2.8 cm in diameter. Then temperature coefficient of reactivity at an operating temperature of 350 °C is _____ $\times 10^{-5}$ /K.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) -1.4,-1.38

12) A heavy-water-moderated thermal reactor is operating with a utilization factor of 0.85. Density & molar mass of heavy water are 1.107 g/cc & 20.027 g/mol respectively. If the scattering & absorption cross-sections of heavy water are 10.6 & 0.001 barns respectively, then corresponding prompt neutron lifetime is _____ ms.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 20.48,20.49

13) Consider a uranium-based infinite thermal reactor operating over a long period, which involves only three isotopes during its operation, namely, U-235, U-238 & Pu-239. The operation is initiated with 1% enriched uranium and a constant neutron flux of 10^{13} neutrons/cm²s. Then the amount of Pu-239 as a fraction of initial fuel mass after 1 year of operation is _____%.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 7.0,7.3

1 point