

Unit 6 - Week 4:Chain Reaction in Reactors

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

- Lec 1:Neutron multiplication factor
- Lec 2:Neutron diffusion theory
- Lec 3:Solution of one-group diffusion equation
- Lec 4:Simple reactor theory
- Quiz : Assessment 4
- Feedback form

Week 5 : Reactor Thermalhydraulics

Week 6:Reactor Control

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 4

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

Due on 2020-02-26, 23:59 IST.

- 1) Smallest amount of mass of the fissile material required to sustain a chain reaction is known as 1 point
- minimum mass
 critical mass
 reaction mass
 fractional mass
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *critical mass*
- 2) In order to reduce the neutron leakage, reactor cores are often surrounded with material having 1 point
- high scattering & absorption cross-section
 low scattering & absorption cross-section
 low scattering & high absorption cross-section
 low absorption & high scattering cross-section
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *low absorption & high scattering cross-section*
- 3) Increase in the concentration of fission products having large absorption cross-section leads to 1 point
- increase in thermal fission
 decrease in fuel utilization
 decrease in resonance absorption
 increase in core reactivity
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *decrease in fuel utilization*
- 4) Reactivity for a supercritical reactor is 1 point
- negative
 zero
 positive
 undefined
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *positive*
- 5) Which of the following nuclei is the largest contributor towards resonance absorption? 1 point
- U-233
 U-234
 U-235
 U-238
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *U-238*
- 6) Effective multiplication factor can be obtained multiplying the infinite multiplication factor with 1 point
- total non-leakage probability
 reciprocal of total non-leakage probability
 fast neutron non-leakage probability
 thermal neutron non-leakage probability
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *total non-leakage probability*
- 7) Fick's law of diffusion is not applicable in a medium with 1 point
- direction-independent scattering cross-section
 uniform property distribution
 large absorption cross-section
 infinite dimensions
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *large absorption cross-section*
- 8) Two identical point sources of neutron, each emitting 'S' neutrons/s, are located at a certain distance apart in an infinite diffusing medium. Then neutron current at the midway between the sources is 1 point
- zero
 S
 2S
 infinite
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *zero*
- 9) Diffusion length in a medium is 1 point
- smaller than mean free path
 equal to mean free path
 larger than mean free path
 independent of diffusion coefficient
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *smaller than mean free path*
- 10) A reactor operating primarily with fast neutrons should have 1 point
- a moderator with large absorption cross-section
 a moderator with large scattering cross-section
 high concentration of a neutron poison
 no moderator
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *no moderator*
- 11) Peaking factor for an infinite slab reactor is 1 point
- $2/\pi$
 $\pi/2$
 π
 2π
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *$\pi/2$*
- 12) Mathematical estimation of neutron flux profile for a reflected reactor at the interface of core & reflector requires 1 point
- continuity of diffusion coefficient
 continuity of neutron flux
 continuity of both neutron flux & its gradient
 continuity of neutron current density
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *continuity of both neutron flux & its gradient*
- 13) For a critical reactor, _____ & geometrical buckling are equal to each other. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: String) material*
- 14) Resonance escape probability refers to the ratio of number of neutrons after and before the process of _____. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: String) moderation*
- 15) A supercritical reactor is initially operating with a multiplication factor of 1.1. If the multiplication factor increase by 2%, percentage change in reactivity will be _____. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 19.5,20.0*
- 16) A sample of enriched fuel contains only U-235 & U-238. The former has fission & non-fission capture cross-sections of 579 & 101 barns respectively. Absorption cross-section for U-238 is 2.72 barns. Fission of a single U-235 nucleus produces 2.42 neutrons on average. If a thermal fission factor of 1.7 is desired from the sample, amount of U-235 in the fuel must be _____. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 1.84,1.86*
- 17) A nuclear reactor is operating with a fuel having net absorption cross-section of 4.75 barns. Heavy water is used as the moderator, with the composition being 200 molecules of D₂O for every fuel molecule. Boron is used as a part of the control mechanism. Capture cross-sections of D₂O & boron are 0.001 & 760 barns respectively. If a thermal utilization factor of 0.80 is the objective, the required number of boron molecules is _____ for every molecule of fuel. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 0.0010,0.0015*
- 18) A thermal reactor is operating with a thermal fission factor is 1.43, thermal utilization factor of 0.88 and resonance escape probability of 0.94. If the contribution of fast fission is negligible, then _____% of total neutrons can be allowed to leak from the core, in order to maintain it critical. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 15,16*
- 19) Scattering cross-section of carbon (A = 12) at 1 eV is 4.8 barns. If the density of graphite is 1.599 g/cm³, the diffusion coefficient of graphite at this energy is _____ cm. 1 point
-
- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 0.915,0.917*
- 20) A point source is emitting neutrons at a rate of 10⁷ neutrons/s and is located in an infinite body of water. If diffusion coefficient and diffusion length for water are 0.16 cm and 2.85 cm respectively, neutron flux at a distance of 15 cm from the source will be _____ neutrons/mm² s. 1 point
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- No, the answer is incorrect.**
Score: 0
Accepted Answers: *(Type: Range) 17.0,17.5*