LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – NOVEMBER 2015

PH 3955 - REACTOR PHYSICS

Date : 07/11/2015   Dept. No.   Max. : 100 Marks
Time : 09:00-12:00

PART A

Answer ALL questions   **(10X2=20 marks)**

1. How do you explain nuclear fission from the binding energy -mass graph?

2. One gram of a radioactive substance disintegrates at the rate of 3.7×10^{10} dis/sec. The atomic weight of the substance is 226. Calculate the mean life.

3. Calculate the fuel consumption rate for U^{235}, with given values $\alpha=0.175, P=3MW, E_R=168$ MeV.

4. Define breeding ratio.

5. What is the significance of a moderator in a nuclear reactor ?

6. Differentiate reentrant and non-reentrant surfaces.

7. Show that the density of nucleus is always constant.

8. State the boundary conditions for the fermi age equation.

9. What are delayed neutrons?

10. Explain why blackrods are not used in modern reactor?

PART B

Answer any FOUR questions   **(4x7.5=30 marks)**

11. Explain critical ,subcritical and supercritical states of a reactor?

12. Distinguish between the thermal and fast reactors.

13. State and explain reciprocity theorem.

14. Define "Lethargy". Show that to a good approximation ,the average increase in lethargy in any moderator is $2/(A+2/3)$.

15. The need of a thermal shield is less for boiling water reactor than pressurized water reactor. Justify.

16. Explain the various nuclear power programs in India.

PART C

Answer any FOUR questions   **(4x12.5=50 marks)**

17. Explain the term "neutron balance" and discuss the conditions for criticality in a reactor.

18. What do you mean by "Buckling" in a nuclear reactor.? Obtain an expression for buckling and asymptotic flux distribution of rectangular parallelepiped reactor system.

19. Show that the thermal non-leakage probability $P_T = 1/(1+B^2 L_T^2)$.

20. Write the relation connecting temperature co-efficient and reactivity of a reactor and also write an expression for the temperature co-efficient interms of multiplication factor.

21. Show that for the isotropic scattering in the centre of mass system, the probability function P(E E') for elastic scattering between the energies E and αE is given by the formulae, P(E E') ={1/E(1-α)   for αE<E'<E and 0 for E<E'< αE }

22. Discuss modified one group theory, and derive an expression for reactivity worth of a small central cylindrical rod.

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