LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2017**

16PPH3ES03 – REACTOR PHYSICS

Date: 10-11-2017　　　Dept. No. 　　　　　　　　　　Max. : 100 Marks
Time: 09:00-12:00

PART A
Answer ALL questions　　　　　　　　　　　　　　　　　　　　　(10×2=20)

1. How do you explain nuclear fission from the binding energy graph?
2. Calculate the fuel consumption rate for U^{235} with given values, thermal value =0.175,E_R=200 MeV and power=1 MW?
3. Define neutron current density.
4. Write a short note on the significance of control rods.
5. State Fick's law of diffusion
6. Write down reactor equation for infinite homogeneous reactor.
7. Determine buckling of spherical reactor with radius 1.32 c.m..
8. Find thermal migration area of the reactor with diffusion area L_T^2 =310 c.m^2 and $_T$=392 c.m^2.
9. A radio active sample has its half life equal to 60 days. Find its disintegration constant and average life.
10. If the fission process starts with 1000 neutrons and the multiplication factor K=1.05,Calculate the number of neutron in the hundredth generation.?

PART B
Answer ANY FOUR questions　　　　　　　　　　　　　　　　　　(4×7.5=30)

11. Describe the working of power reactor and state its uses
12. Derive the expression for buckling and asymptotic flux distribution for finite cylinder
13. Show that the thermal non-leakage probability $P_F=1/1+B^2L_T^2$.
14. State and explain reciprocity theorem.
15. Bombay requires 3000MWh of electric energy per day. It is to be supplied by a reactor which converts nuclear energy, with an efficiency of 20%.If the reactor uses nuclear fuel of U^{235},calculate the mass of U^{235} needed for one day's operation.
16. Write Fermi age equation and solve it for a planar source in an infinite medium.

PART C
Answer ANY FOUR questions　　　　　　　　　　　　　　　　　　(4×12.5=50)

17. Discuss the theory of one region finite thermal reactor and explain criticality.
18. a. Nickel 59 has an absorption cross section of 4.8 and a scattering cross section of 17.5. Compute the moderator ratio for Nickel .How many collisions would be required to thermalize a 1 MeV neutron.(Given Kinetic energy of thermal neutron=1/25 ev)(5)
18. b.A reactor is developing nuclear energy at a rate of 32,000KW.How many atoms of U^{235} would undergo fission per second? How many Kg of U^{235} would be used up in 1000 hours of operation.(Given that on an average 200MeV is released per fission and Avogadro Number=6.023x10^{23}) (7.5)
19. Derive the reactivity equation in the case of an infinite reactor with delayed neutrons?\
20. Define "Lethargy". Show that to a good approximation the average increase in lethargy in any moderator is 2/A+2/3.
21. In detail discuss about nuclear reactors in India.
22.Obtain an expression for rod worth of small central cylindrical control rod by modified one group theory.

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