LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2016**

PH 3955 – REACTOR PHYSICS

Date: 11-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART A

Answer ALL Questions (10x2=20)

1. If the reactor is sphere with a diameter of 108 c.m, Find Buckling of the system?
2. Write a short note on physical significance of "Fermi age equation"?
3. Differentiate prompt and delayed neutrons.
4. Define neutron current density vector.
5. Write a short note on hazards of nuclear reactors?
6. State Fick's law of diffusion?
7. Calculate the binding energy and binding energy per nucleon of $_{26}Fe^{56}$ nucleus from the given data.(Mass of $_{26}Fe^{56}$ nucleus =55.9349 a.m.u, Mass of 1 proton=1.007276 a.m.u, Mass of 1 neutron=1.008665 a.m.u.}.
8. The disintegration constant of a radioactive element is 0.00231 per day .Calculate its half life.
9. Fast breeder reactors do not require moderator. Why?
10. How does the insertion of a control rod in a reactor change its multiplication factor?

PART B

Answer ANY FOUR Questions: (4x7.5=30)

11. Explain Nuclear fission based on liquid drop model of nucleus.
12. Distinguish between thermal and fast reactors.
13. State and explain Reciprocity theorem.
14. Derive the prompt critical condition when the reactor is critical.
15. Show that the thermal non leakage probability P_T is given by $1/(1+B^2 L_T^2)$.
16. Define moderating ratio. Nickel -59 has an absorption cross section of 4.8 barns and a scattering cross section of 17.5 barns. Compute the moderating ratio for nickel. How many collisions would be needed to thermalize a 1 Mev neutrons?

PART C

Answer ANY FOUR Questions. (4x12.5=50)

17. Give an account on Nuclear reactors development in India.
18. Derive the reactivity equation in the case of an infinite reactor with delayed neutrons. Explain the nature of roots in the reactivity equation.
19. A hypothetical point source of one speed neutrons emit 10^7 neutrons /sec into a surrounding infinite "graphite "block .Determine the neutron flux at a distances of 0.24m,0.52m and 1.08m from the source. For graphite assume $1/L=1.86\ m^{-1}$ .D=9.42 mm.
20. Derive an expression for the asymptotic flux for finite cylinder.
21. Obtain an expression for rod worth of control rod by modified one group theory.
22. a) Prove that reactors having negative temperature co-efficient are stable with respect to temperature changes. (4)
    b) Estimate the core life of infinite thermal reactor. (8.5)

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