Dr. PKS

Reg. No.										

MANIPAL UNIVERSITY

Make up

DEPARTMENT OF SCIENCES

FOURTH SEMESTER MSc (PHYSICS) END SEMESTER MAKE-UP EXAMINATION, JUNE - 2016

SUBJECT: NUCLEAR PHYSICS III (PHY-708.6)

(CREDIT SYSTEM)

TIME: 3 HOURS MAX. MARKS: 50

Answer Any FIVE full questions. Each sub questions carries FIVE marks.

1. (a) Explain the estimation of nuclear size using Muon X ray method.
   (b)Explain molecular beam magnetic resonance method of determination of nuclear magnetic moment.
2. (a) Explain Fermi Age Model for neutron slowing down in an infinite rector and obtain an expression for neutron flux for a non-absorbing medium.
   (b)Show that critical energy of deformation for causing fission is a linear function of the parameter Z^2/A.
3. (a) What is the Lawson's criterion for nuclear fusion reaction? Explain.
   (b) Obtain minimum critical volume for a reactor with rectangular parallelepiped geometry in terms of critical buckling.
4. (a) What is a breeder reactor? Explain the breeding principle with an example.
   (b) Explain elementary theory of neutron diffusion. Compute average number of collisions to thermalize 2 MeV neutrons in deuterium.
5. (a) How does a neutron reflector alters the critical geometry of reactor core. Explain.
   (b)Explain "magnetic pressure" with reference to nuclear fusion reaction. In neutron induced fission of U-235 nucleus, 185 MeV energy is released. If a reactor is continuously operating at a power level of 100 MW, how long will it take for one kg of Uranium to be consumed in the reactor?
6. (a) How to produce transuranic element Californium (Z=98) isotope and mention its properties . Write down the outer electronic configuration for the same element.
   (b) A reactor core contains fuel and moderator [Σ_s= 0.64 cm^{-1}, ζ = 0.17]. The thermal neutron flux is $2x10^{12}$ neutrons/(cm^2)(sec) and Σ_a for thermal neutrons in the fuel is 0.005 cm^{-1}; for each thermal neutrons absorbed, 1.7 fission neutrons are produced. Estimate the epithermal neutron flux per unit lethargy interval.

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