Dr. PKS

Reg. No.										

MANIPAL UNIVERSITY

DEPARTMENT OF SCIENCES

FOURTH SEMESTER MSc (PHYSICS) END SEMESTER EXAMINATION MAY - 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 electron scattering experiment of measurement of nuclear charge radius.

   (b) What is the origin of nuclear magnetic moment? Explain molecular beam magnetic resonance method of determination of nuclear magnetic moment.

2. (a) Obtain an expression for the flux of neutrons as a function of energy, while being slowed down without absorption.

   (b)Show that critical energy of deformation for causing fission is a linear function of the parameter Z^2/A.

3. (a) Explain any two basic characteristics of nuclear fusion reaction.

   (b) Obtain minimum critical volume for a reactor with spherical geometry in terms of critical buckling.

4. (a) Arrive at four factor formula for a neutron multiplying system and hence give the condition for criticality.

   (b) What is the role of a moderator in a nuclear reactor? Explain with an example. 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 "pinch effect" 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 Plutonium (Z=94) isotope and mention its properties . Write down the outer electronic configuration for the same element.

   (b) Give an interpretation for an asymmetry in the yield distribution of fission fragments. A hypothetical point source of thermal neutrons emits 10^6 neutrons per second into a surrounding infinite graphite block. Determine the neutron flux at a distance of 54 cm from this source. (Given: κ (=1/L) is 0.0185 cm^{-1} and D is 0.94 cm)

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