MANIPAL UNIVERSITY

Reg. No.										

Deemed- to -be -University under Section 3 of the UGC Act, 1956

DEPARTMENT OF SCIENCES, M.Sc. (PHYSICS)
IV SEMESTER - END SEMESTER EXAMINATIONS, APRIL 2017

SUBJECT: NUCLEAR PHYSICS III [PHY-708.6]

(REVISED CREDIT SYSTEM)

Time: 3 Hours Date: MAX. MARKS: 50

Note: (i) **Answer Any FIVE full questions. Each sub questions carries FIVE marks.**

1. (a) Explain muonic x-ray method of measurement of nuclear size.

   (b) Explain molecular beam magnetic resonance method of determination of nuclear magnetic moment.

2. (a) Obtain Fermi age equation to represent the spatial distribution of slowing down density according to continuous slowing down model. What is the significance of age?

   (b) Obtain limiting condition for a heavy nucleus to be stable against spontaneous fission.

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

   (b) Obtain minimum critical radius for a reactor with spherical geometry in terms of critical buckling using one group equation.

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

   (b) Determine the infinite multiplication factor of a uniform mixture of uranium-235 and beryllium oxide in the atomic ratio of 1 to 10000. The value of σ_a for beryllium oxide is 0.010 barn. The resonance escape probability and the fast fission factor may be taken to be unity. η for uranium-235 is 2.06.

5. (a) What are neutron monochromators. Explain the working principle of crystal monochromators.

(b) Assume that in each fission of ^{235}U, 200MeV is released. Assuming that 5% of the energy is wasted in neutrinos, calculate the amount of ^{235}U burned which would be necessary to supply at 30% efficiency. Assume the whole annual electricity consumption is 50×10^9 kWh.

6. (a) How to produce transuranic element Americium (Z=95) isotope using alpha particle as projectile and mention its properties. Write down the outer electronic configuration for the same element.

   (b) Estimate the energy released in fission of $^{238}U_{92}$ nucleus, given a_c = 0.59 MeV and a_s = 14.0 MeV.