Reg. No. : ...............................

Name : ...................................

**III Semester M.Sc. Degree (CBSS – Reg./Sup./Imp.) Examination, October 2022**
**(2019 Admission Onwards)**
**PHYSICS**
**PHY 3C 12 : Nuclear and Particle Physics**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a** or **b**).

(2×12=24)

1. a) Explain Fermi theory of beta decay.

OR

   b) Choose a suitable shell model potential and analyse the expected energy levels, magnetic moment and quadrupole moment of nuclei.

2. a) Explain Quark model using the eight fold way symmetry.

OR

   b) Discuss various types of nuclear reactions and conservation laws.

SECTION – B

Answer **any 4** (**1** mark for part **a**, **3** marks for part **b** and **5** marks for part **c**). (4×9=36)

3. a) What are mass spectroscopes ?

   b) How do you calculate nuclear mass using mass spectrograph ?

   c) Explain mass doublet method using an example.

4. a) Define and explain neutron separation energy.

   b) What is the significance of mass parabola ?

   c) Derive semi empirical mass formula.

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5. a) What do you understand by quadrupole moment of nuclei ?

   b) Describe characteristics of nuclear force.

   c) Elaborate on shell model potential.

6. a) Define internal conversion coefficient.

   b) What are the characteristics of magnetic dipole radiation ?

   c) Explain magnetic and inertial confinement.

7. a) Define Isospin of nucleus.

   b) Explain compound-nucleus reaction.

   c) Discuss nuclear reaction cross sections.

8. a) Write any two characteristics of fission.

   b) Calculate the activation energy in the case of $^{236}U$.

   c) Calculate the activation energy of fission using Liquid Drop Model.

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