

Unit IV

8. Describe the different types of nuclear reactions, including elastic scattering, inelastic scattering, and spallation reactions with examples. 8
9. Describe the construction, working principles, and applications of nuclear fission reactors. 8



No. of Printed Pages : 04

Roll No.

28859

B.Sc. EXAMINATION, 2025

(Fifth Semester)

PHYSICS

Paper–X

Nuclear Physics

Time : 3 Hours]

[Maximum Marks : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. Use of non-programmable scientific calculator is allowed.

(Compulsory Question)

1. (a) Define nuclear binding energy. 2

- (b) What are the three main types of beta decay ? 2
- (c) Explain the working principle of a Betatron. 2
- (d) Describe the purpose of a reactor moderator. 2

Unit I

- 2. Write the properties of nuclei such as mass, size, spin, parity and dipole moment. 8
- 3. (a) Explain the methods for determining nuclear mass by Bain-Bridge mass spectrograph. 6
- (b) The mass of a helium-4 nucleus is 4.0015 u. Calculate its binding energy per nucleon if the mass of a proton is 1.0078 u and the mass of a neutron is 1.0087 u. ($1 \text{ u} = 931.5 \text{ MeV}/c^2$). 2

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Unit II

- 4. Explain the neutrino hypothesis and its role in understanding the beta decay spectrum. 8
- 5. (a) Describe the range and straggling of Alpha particles in a medium. 5
- (b) Explain the phenomenon of pair production. 3

Unit III

- 6. (a) Describe the construction, working and applications of a linear accelerator. 6
- (b) Calculate the kinetic energy of protons accelerated through a potential difference of 500 kV in a linear accelerator. 2
- 7. Write in detail the principle, construction and working of a G.M. counter and its applications in nuclear physics. 8

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