Roll No.							

25-PH-21

M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION
MAY - JUNE 2025

PHYSICS

Paper - I

[Quantum Mechanics – II]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 What do you understand by Scattering Cross Section ? Determine an expression for the Scattering Cross Section of particles by spherically symmetric potential.

OR

Discuss the method of partial wave for the study of scattering problems. What are the suitable conditions for the application of the method ?

Q. 2 Discuss briefly the Time Dependent Perturbation Theory.

OR

What is a Slater determinant and why is it used in the Hartree–Fock method ? Show how the use of a Slater determinant leads to the exchange term in the Hartree – Fock equations.

Q. 3 Distinguish between spontaneous emission, stimulated emission and absorption in the context of atom – field interactions.

OR

Compare Rayleigh scattering and Raman scattering in terms of particle size, wavelength dependence and physical origin.

Q. 4 What is the semi – classical approximation in quantum mechanics ? Describe how it bridges classical and quantum descriptions of particle motion.

OR

Derive the Wentzel – Kramers – Brillouin approximation for the time – independent Schrodinger equation in one dimension.

Q. 5 Write short notes on **any two** of the following –

i) Green's Function.

ii) Fermi's golden rule.

iii) Parametric down conversion.

iv) Topological quantum computation.