A–0437

Total Pages : 3 **Roll No. .....**

MSCPH-512

Master of Science Physics (MSCPH)

Advanced Quantum Mechanics

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. What is Born approximation ? Obtain the scattering cross-section for a screened coulomb field using Born approximation.

2. Discuss the first order time dependent perturbation theory and derive the Fermi-goldan rule for the transition rate from a given initial state to a final state of continuum.

3. Obtain expression for spin and magnetic moment of electron using Dirac's relativistic theory.

4. What do you mean by identical particles ? Discuss the quantum structure of free fields and the particle concept.

5. Discuss the second quantization of Bosons and Fermions and Quantization of Dirac equation..

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. What are the suitable conditions for the study of scattering problem by the method of partial wave analysis ?

2. Distinguish between adiabatic approximation and sudden approximation.

3. What are the selection rules for dipole transitions ?

4. Mention the difficulties with K-G equation and interpret the negative energy states.

5. Obtain expression for Lagrangian density.

6. Construct symmetric and anti symmetric wave function for three spinless identical particle from unsymmetrised wave function

7. Discuss commutation and anticommutation relations.

8. What are creation and annihilation operators ?

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