K-420

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

MSCPH-512

Advanced Quantum Mechanics

M.Sc. Physics (MSCPH)

3rd Semester Examination, 2023 (Dec.)

Time : 2 Hours] **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)

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.

(2×19=38)

1. What is the physical meaning of the scattering cross-section? Describe the method of partial wave to calculate Phase shift and scattering amplitude.

2. Give the theory of induced emission and absorption of radiation on the basis of time dependent perturbation theory.

3. Derive Dirac's relativistic wave equation. Obtain spin and magnetic moment of electron using Dirac's relativistic theory.

4. Describe identical particles and exchange degeneracy. Discuss Schwinger's action principle.

5. Describe quantization of the Schrödinger equation for non relativistic domain and formalize it for system of Bosons.

SECTION–B

(Short Answer Type Questions)

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. (4×8=32)

1. State the condition of validity of Born approximation.

2. Explain Fermi's golden rule.

3. What are the selection rules for dipole transition?

4. Derive Klein-Gordan equation and obtain expression for current and position probability density.

5. Interpret the negative energy state of electron in Dirac theory.

6. Explain symmetric and antisymmetric functions for many particle system.

7. Obtain expression for Lagrangian density.

8. Explain in brief creation and annihilation operator in quantization of non-relativistic Schrödinger matter field.