S-498

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

MSCPH-512

Advance Quantum Mechanics

M.Sc. Physics (MSCPH)

3rd Semester Examination, 2022 (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.

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. Define the scattering cross-section. Describe the method of partial waves for potential scattering obtain the relation between phase shift and potential.

2. Give the theory of low energy Scattering Born approximation and discuss its validity.

3. Set up Klein-Gordon equation for a free particle and find out the energy lends of such a particle in the presence of Coulomb field.

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

5. Give an account of second quantization for a harmonic oscillator and interpret the annihilation operators. Show that an electromagnetic field can be thought of as mathematically equivalent to a system of harmonic oscillators.

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

2. Derive the theory of Born-approximation in scattering to calculate scattering length.

3. Discuss Fermi's-Golden rule.

4. Explain Semi Classical treatment of an atom with electromagnetic radiation.

5. Explain the interpretation of negative energy states in relativistic quantum mechanics.

6. Discuss magnetic moment of an electron due to spin.

7. What is Schwinger's action principle ?

8. Discuss commutation and anticommunication relations.
