Unit IV

8. Discuss collision of identical particles and calculate the differential cross section for scattering of two identical fermions of spins half. **16**

9. Discuss the singlet and triplet states of Helium atom. Describe the ground and first excited state. **16**

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51041

M. Sc. EXAMINATION, 2026

(Second Semester)

(Re-appear Only)

PHYSICS

Quantum Mechanics—II

(2019-20 Onwards for Colleges and 2018-19 Onwards for UTD)

Time : 3 *Hours*] [*Maximum Marks :* 80

Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What do you mean by perturbation ? **4**

   (b) Explain the importance of Einstein's coefficients for selection of material in laser fabrication. **4**

   (c) Define scattering amplitude and differential cross section. **4**

   (d) Explain Pauli exclusion principle. **4**

Unit I

2. Explain variational principle and by using this principle determine the ground state energy of Helium atom. **16**

3. Apply WKB method for finding the energy eigenvalues and eigen functions for one dimensional potential V(x). **16**

Unit II

4. Describe electric dipole transitions and obtain selection rules for these transitions. **16**

5. (a) What are Einstein's A & B coefficients ? Obtain relation between them. **8**

   (b) Explain sudden approximation. **8**

Unit III

6. Derive an expression for the total scattering cross-section of the particles by spherically symmetric potential. **16**

7. Derive expression for total cross-section of particles in scattering by hard sphere potential for low energy and high energy limits. **16**