

35071

M.Sc. DEGREE EXAMINATION, OCTOBER 2015.

THIRD SEMESTER

Physics

Paper I : QUANTUM MECHANICS

(Revised Syllabus with effect from 2014-2015)

Time : Three hours

Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. Define a wave function. Write its characteristics.
2. Write the properties of Hermitian operator.
3. Describe the Schrodinger picture in quantum mechanics.
4. Which polynomial is used in polynomial method to get eigen values to simple harmonic oscillator.
5. Discuss time dependent perturbation theory.
6. Write in brief about Fermi Golden rule.
7. Differentiate between classical theory of scattering and quantum theory of scattering.
8. Discuss validity of Born approximation.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. (a) Discuss postulates of quantum mechanics.
(b) What are Bra and Ket notations? Write their properties.

Or

10. Obtain reflection and transmission coefficients to finite potential barrier. Discuss quantum mechanical tunneling.

11. (a) Obtain the equation of motion from Heisenberg picture.
(b) Write the properties of Poisson bracket.

Or

12. (a) Obtain eigen values and eigen functions to harmonic oscillator by operator method.
(b) Write the solution to Schrodinger wave equation for a free particle in three dimensions.
13. (a) Discuss perturbed harmonic oscillator by time independent perturbation theory.
(b) Obtain the expression for ground state energy of a normal helium atom.

Or

14. (a) How the Stark effect in hydrogen atom is explained by first order perturbation theory?
(b) Discuss variational methods.
15. (a) What is partial wave analysis?
(b) Write the importance of Greens function in scattering theory.

Or

16. (a) Describe the Born approximation.
(b) Discuss optical theorem.

