

35071 (OR)

M.Sc. DEGREE EXAMINATION, OCTOBER 2015.

THIRD SEMESTER

Physics

Paper I — QUANTUM MECHANICS — I

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. Discuss the postulates of Quantum Mechanics.
2. Write a short note on bra and ket notation.
3. Derive the Eigen functions and Eigen values of L^2 and L_z operators.
4. Find the Clebsch-Gordon Coefficients for $J_1 = J_2$.
5. Derive an expression for first order energy correction when a time independent perturbation is applied to a non degenerate system.
6. Discuss variation method.
7. Explain the terms differential cross section & total scattering cross section.
8. Describe the role of Green's function in scattering theory.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. Obtain the energy Eigen values and Eigen functions for a finite well.

Or

10. Define Hermitian operator. State and prove two properties of Hermitian operator.

11. Discuss the addition of two angular momenta. What are Clebsch Gordon (CG) coefficients? Obtain the recurrence relation between the CG coefficients.

Or

12. Obtain the matrices for σ_x, σ_y and σ_z spin operators and discuss their properties.
13. Discuss the linear stark effect in hydrogen atom.

Or

14. Explain WKB approximation and obtain the connecting formulae.
15. Explain the Born approximation in scattering theory. Discuss the criteria for the validity of first order Born approximation.

Or

16. Discuss the partial wave analysis of scattering phenomena.

