

FACULTY OF SCIENCE

M.Sc. II-Semester (CBCS & Non-CBCS) (New) Examination, April / May 2013

Subject: Physics & Applied Electronics

Paper – III (203)

Quantum Mechanics – II

Time: 3 Hours

Max.Marks: 80

**Note: Answer all questions from Part – A and Part – B.
Each question carries 4 marks in Part-A and 12 marks in Part-B.**

PART – A (8x4 = 32 Marks)

[Short Answer Type]

1. Write the kinematics of scattering process in quantum mechanics.
2. Obtain a relation between phase shift and potential in the scattering process.
3. Explain why the ground state of hydrogen atom will not show a first order stark effect.
4. What are Einstein Coefficients? State their physical significance.
5. Explain variation method.
6. Develop harmonic perturbation in the time dependent perturbation theory.
7. Enumerate the difficulties with Klein-Gordon equation.
8. Express the Dirac equation in covariant form.

PART – B (4x12 = 48 Marks)

[Essay Answer Type]

- 9.(a) Write the asymptotic form of scattered wave function.
(b) Discuss the Born approximation in the scattering process.
OR
(c) Obtain an expression for the phase shift due to scattering using partial wave analysis.
- 10.(a) Deduce the transition probability expression for a transition using variation of constants method.
OR
(b) What is dipole approximation? Explain.
(c) Describe the interaction of electromagnetic radiation with an atom.
- 11.(a) Develop the time independent perturbation theory in the non-degenerate case and obtain expressions for first and second order energy corrections.
OR
(b) Discuss the WKB approximation method and apply it to alpha decay.
- 12.(a) Develop Klein-Gordon equation and evaluate the probability density from it.
OR
(b) Obtain the plane wave solutions to Dirac equation.
(c) Write the properties of alpha and beta matrices.