

FACULTY OF SCIENCE

M.Sc. II-Semester Examination, May / June 2016

Subject : Physics and Applied Electronics

Paper - III

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 (8 x 4 = 32 Marks)
(Short Answer Type)

- 1 Explain the Kinematics of scattering process.
- 2 Obtain a relationship between phase shift and potential.
- 3 What are degenerate and non-degenerate states? Explain.
- 4 Outline the variation method.
- 5 Write a short note on constant perturbation in time dependent perturbation theory.
- 6 State and explain Hamiltonian operator for a charged particle in an electromagnetic field.
- 7 Write the properties of Dirac matrices.
- 8 Deduce Dirac equation in covariant form.

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

- 9 a) Define an expression for scattering amplitude using Green's method.
b) Explain Born's approximation.
OR
c) What is partial wave analysis? Explain.
d) State and prove optical theorem in the scattering theory.
- 10 a) Develop time independent perturbation theory for non-degenerate states upto first order correction to energy and wave function.
OR
b) Discuss the WKB approximation method.
- 11 a) What do you understand by variation of constants in the time-dependent perturbation theory.
OR
b) Discuss the transition probability to closely spaced energy levels and deduce Fermi's gold rule.
- 12 a) Obtain Klein-Gordon equation in relativistic quantum mechanics and show that probability density could be negative.
OR
b) State and explain Dirac equation and write the significances of negative energy states.
