12121509003

Code No. 4181 / CBCS / NON-CBCS / N

# FACULTY OF SCIENCE

**M.Sc. II-Semester (CBCS/NON-CBCS) (New) Examination, May / June 2015**

**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 asymptotic form of scattering wave equation. Distinguish between incoming and outgoing waves.

2 Discuss the optical theorem in the scattering problem. Explain its significance.

3 Distinguish between degenerate and non-degenerate systems.

4 Obtain the ground state energy of Helium atom by variation method.

5 What is harmonic perturbation? Discuss its consequences.

6 Explain electric dipole approximation.

7 Obtain the equation of continuity in Dirac theory.

8 Discuss the properties of Dirac's γ (gama) matrices.

## PART – B (4 x 12 = 48 Marks)

(Essay Answer Type)

9 a) Explain Born approximation and obtain the condition for validity of first Born approximation.

**OR**

b) Apply the method of partial waves to derive the expression for phase shifts of various partial waves in the scattering of a particle by a hard sphere.

10 a) Explain α decay by applying the WKB approximation method.

**OR**

b) Discuss the time dependent perturbation theory for non-degenerate systems and obtain the first order and second order corrections to the energy and wave function.

11 a) What are Einstein's coefficients for spontaneous and induced emission of radiation? Obtain the relation between Einstein's "A' and "B' coefficients for transition probability.

**OR**

b) Discuss the time dependent perturbation theory for constant perturbation and obtain the energy eigen values of first order perturbation.

12 a) Obtain the plane wave solution of Dirac equation. Explain the significance of negative energy states.

**OR**

b) Using Dirac equation explain the motion of a relativistic particle in a central potential.

******