T212-17-509-009

Code No. 3028/CORE

FACULTY OF SCIENCE

M. Sc. II – Semester Examination, May / June 2018

Subject : Physics & 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 Define the differential and total cross-section.
2 Write the Green's functions and explain in its significance.
3 Describe the perturbation for Stark effect in a Hydrogen atom for n=2 level.
4 What is Fermi –Golden rule and write its significance.
5 Write the connecting formulas and explain Alpha decay.
6 Explain constant perturbation method.
7 What are the inadequacies of Klein Gordon equation?
8 Explain the Dirac's negative energy spectrum.

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

9 (a) Describe the scattering phenomenon by Born approximation method and obtain an Equation for scattering cross-section. Explain the validity of Born's approximation.

OR

(b) Describe the theory of partial wave analysis for the scattering and obtain an expression for scattering cross-section and amplitude. Define optical theorem.

10 (a) Discuss the first order time independent perturbation theory for a degenerate System. Obtain first order corrected energy eigen values for a ground state Helium atom.

OR

(b) Discuss the WKB approximate method for a slowly varying potential and obtain transmission coefficient for a potential barrier. What is validity condition for WKB approximation.

11 (a) Describe the time dependent perturbation theory and obtain an equation for transition probability. Write the selection rules for transition.

OR

(b) Explain the interaction of an atom with electromagnetic radiation. Derive the Einstein coefficients.

12 (a) Derive Klein Gordon relativistic equation and obtain its plane wave solution. Explain probability density and probability current density.

OR

(b) Write the Dirac's relativistic equation for a free particle. Write the Properties of Dirac's matrices. Obtain Dirac's free particle solutions and explain the spin.

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