SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc. END SEMESTER EXAMINATION APRIL/NOV - 2021
SEMESTER - II
20PPHCT2005 - Quantum Mechanics - II

Total Duration : 3 Hrs		**Total Marks : 75**	
MCQ	: 30 Mins	MCQ	: 15
Descriptive	: 2 Hrs.30 Mins	Descriptive	: 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Discuss transformation from centre of mass to laboratory frame of coordinates. Obtain a relation between cross-sections in L system and C system.
2. Discuss Born approximation and obtain an expression for scattering cross-section.
3. Derive Klein-Gordan equation for a charged particle in electromagnetic field.
4. Write down the creation and annihilation operators.
5. Describe adiabatic approximation and deduce expression for total probability of transition.
6. What are antiparticles? Interpret negative energy states.
7. Explain the selection rules for dipole radiation.
8. Discuss Feynman's theory of positron.

Section C

Part A

Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Apply the method of partial wave analysis to deduce an expression for the differential cross-section for elastic scattering by spherically symmetric potential.
10. Develop time-dependent perturbation theory and obtain an expression for the transition probability.
11. Give the theory of addition of angular momentum in terms of Clebech – Gordon coefficients.
12. Discuss creation and Annihilation operators and explain their significance.

Part B

Compulsory question $(1 \times 10 = 10$ Marks)

13. Write down the Dirac equation in an external electromagnetic field and deduce that a Di-rac electron has magnetic moment (eh/4πmc).σ and give a physical interpretation of the result.