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 EXAMINATIONS APRIL - 2022
SEMESTER - II
08PPHCT2005 **&** PPH/CT/2005 - **QUANTUM MECHANICS II**

Total Duration : 3 Hrs. **Total Marks : 60**

Section A

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

1. Discuss transformation from centre of mass frame to Laboratory frame.
2. Explain the theory of sudden approximation.
3. Derive klein-Gordon equation and explain its significance.
4. Give the four contravariant Gamma matrices and list their important properties.
5. Show that the creation and annihilation operators commute for any two **k** and $\mathbf{k}'$ but do not commute among themselves.
6. Derive the selection rules for dipole radiation from the semi-classical treatment of an atom with electromagnetic radiation.
7. Discuss spin of an electron and derive an expression for magnetic moment of the electron due to its spin.
8. Discuss Feynman's theory of pair production and annihilation.

Section B

Part A

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

9. Explain partial wave analysis of scattering of low energy particles and derive an expression for the scattering cross-section.
10. Obtain the plane wave solutions of Dirac's equation and explain the significance of negative energy states.
11. Obtain the covariant form of Dirac's equation and establish the invariance of the relativistic Dirac equation.
12. Discuss the second quantization of Klein-Gordon field and derive expression for creation and annihilation operators.

Contd...

Part B

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

13. Apply time dependent perturbation theory to constant perturbation and derive expression for transition probability per unit time.

*****