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.(Physics) END SEMESTER EXAMINATIONS NOVEMBER - 2023
SEMESTER - II

22PPHCT2005 - Quantum Mechanics II

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

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

1. Describe the relation connecting the differential cross-section in centre of mass and laboratory frames.
2. Explain the probability of transition under the influence of sudden approximation.
3. Work out klein-Gordon equation and mention its significance.
4. Sketch the covariant formulation of Dirac equation.
5. Illustrate the second quantization of electromagnetic field with creation operator.
6. State the conditions for the validity of Born Approximation for scattering.
7. Using Dirac's equation, show that the electron is endowed with a spin $1/2$.
8. Obtain the sudden probability of transition between two states.

Section C

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

9. Apply time dependent perturbation theory to constant perturbation and derive expression for transition probability per unit time.
10. Determine the total scattering cross section using the method of partial waves.
11. Obtain the plane wave solutions of Dirac's equation and explain the significance of negative energy states.
12. Derive the covariant form of Dirac equation.

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

13. Explain how you will obtain the magnetic moment of the electron in Dirac's relativistic theory.

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