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.
B.Sc.Physics - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - VI
20UPHCT6012 - Relativity and Quantum Mechanics

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

Section B

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

1. Obtain Galilean transformation equations and show that the acceleration is invariant under Galilean transformation.
2. How fast a rocket has to move relative to an observer for its length to be contracted to 99 % of its length at rest?
3. Derive the relation between group velocity and phase velocity.
4. State and Explain Heisenberg's uncertainty principle and give its mathematical proof.
5. What is a wave function?Obtain the standard form of the wave function of a quantum particle.
6. Describe barrier penetration problem and write the wave functions of the regions in this problem.
7. a) Define expectation value of a dynamical operator.
   b) Write the expectation value of momentum and energy.
8. What are linear operators? Explain linear operator with examples.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Obtain the expression for variation of mass with velocity.
10. Describe the G. P. Thomson electron diffraction experiment for the verification of matter waves.
11. With neat steps derive the time dependent Schrodinger wave equation.
12. Obtain the energy eigen values and eigen function of a quantum particle trapped in one dimensional box.
13. Discuss the basic postulates of wave mechanics.

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