Roll.No. | **20UPHCT6012**

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 - NOVEMBER 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. A spaceship moves at 0.6c relative to Earth. Using the time dilation formula, determine the time experienced by astronauts for an event lasting 5 hours on Earth.
2. Illustrate the concept of relativistic velocity addition.
3. Calculate the de Broglie wavelength of neutron of energy 28.8 eV. Given h=6.62x10^{-34} J-S, m=1.67x10^{-27} kg.
4. Derive the relationship between group velocity and phase velocity.
5. Derive the one dimensional wave equation for a free particle.
6. Calculate the energy eigen value for a particle in a one dimensional box.
7. Deduce the expression corresponds to the expectation value of energy and momentum.
8. Using Hamiltonian operator deduce Schrodinger's time dependent three dimensional wave equation.

Section C

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

9. Investigate the effect of Lorentz transformation on the space-time interval and explain its invariance.
10. Explain the Davisson–Germer experiment and Examine how it demonstrates the wave nature of electrons.
11. Derive time independent Schrodinger's wave equation.
12. Analyze the quantum mechanical aspects in describing the linear harmonic oscillator problem.
13. Give an inference on basic postulates of wave mechanics.

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