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-2023
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 clock in a space ship emits signals at intervals of 1 second as observed by an astronaut in the space ship. If the space ship travels with a speed of 3×10^7 ms^{-1}, what is the interval between successive signals as seen by an observer at the control centre on the ground?
2. Discuss the experimental basis of Davisson Germer experiment.
3. Derive De Broglie's relation for wavelength.
4. Show that if two Hermitian operators commute, then their product is also a Hermitian operator.
5. Explain the postulates of quantum mechanics.
6. Determine the energy levels of a linear harmonic oscillator on the basis of the Schrodinger's equation.
7. Derive the relation between angles between L-system and C-system.
8. Show that $\mu = \dfrac{m_1 m_2}{m_2 + m_2}$

Section C

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

9. Describe the Michelson-Morley experiment and explain the physical significance of negative results.
10. What is Heisenberg's uncertainty principle? How does it prove the non-existence of electrons inside the nucleus?
11. Derive the one dimensional time dependent and time independent Schrodinger wave equations.
12. From Schrodinger's wave equation, derive an expression for complete wave function for a free particle.
13. Show that the differential scattering cross-section is equal to the square of the scattering amplitude.

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