

Roll No. ....

51192

B. Sc. (Pass Course) 5th Semester  
(Regular/Re-Appear/Improvement)  
Examination – December-2022

PHYSICS (QUANTUM MECHANICS)

Paper : PHY-502

Time : Three hours ]

[ Maximum Marks : 45

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting at least one question from each Unit.

UNIT – I

1. (a) What is Compton Effect ? Derive an expression for the Compton shift. 7
- (b) What will be the de-Broglie wavelength of a proton having K. E. 300 eV. 2
2. (a) What is Heisenberg uncertainty principle ? Apply this principle to find the radius of Bohr's first orbit. 5

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- (b) What are limitations of old Quantum theory ? 4
- (a) Define group velocity, phase velocity and particle velocity. Derive a relation between group velocity and particle velocity of a relativistic particle. 7
- (b) Write a note on Heisenberg gamma ray microscope. 2

UNIT – II

4. What do you understand by a harmonic oscillator ? Obtain an expression for energy levels of the harmonic oscillator. Apply Schrodinger equation, plot the energy levels of the oscillator and compare it with hydrogen atom. 9
5. Write a note on the following :
  - (a) Normalisation of the wave function 3
  - (b) Observable and operator 3
  - (c) Orthogonality of wave function 3

UNIT – III

5. Calculate the reflection and transmission coefficients of a particle through a one dimensional rectangular potential barrier. 9

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7. Define one dimensional box. Using Schrodinger wave equation find the expression for the energy Eigen values for a particle in one dimensional box. Also find zero point energy of the box. 9
8. (a) Show that the linear momentum of the particle in one dimensional box is quantized. 5
- (b) Electrons with energies of 1 eV and 2 eV are incident on a barrier of 10 eV high and 0.50 nm wide. Find the respective transmission probabilities. 4
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