QP CODE: 25805018

Reg No : .....

Name : .....

INTEGRATED M.Sc DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

INTEGRATED M.Sc BASIC SCIENCE-PHYSICS

CORE - IPH3CR02 - QUANTUM MECHANICS -1

2021 Admission Onwards

5FD1BE6C

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write a short note on De Broglie's hypothesis.
2. What was the purpose of the Davisson–Germer experiment?
3. What are the postulates of linear vector space?
4. What are orthogonal state vectors?
5. Only Hermitian operators are associated with physical quantities. Why?
6. Explain Hamiltonian opeartor.
7. Give the difference between probability density and probability current density of a wave function.
8. Why Unbound state have a continuous spectrum?
9. Explain the term spherical harmonics.
10. Explain the principal quantum number.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain the failure of classical theory ,Rayleigh–Jeans law, in explaining blackbody radiation.
12. Discuss the dependence of blackbody radiation intensity on temperature
13. Show that the position operator x and momentum component P_y commute.
14. State and prove Schwartz's inequality.
15. Show that the probability density depends on time for a particle in the superposition of states.
16. The time-independent wave function of a particle of mass m moving in a constant potential V is e^{-ax}, where a is constant. Find the total energy.
17. Draw the energy level diagram of the Infinite square well potential.
18. Calculate the energy eigenvalue in eV of ground state electron in the Hydrogen atom.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Explain the experimental study of the photoelectric effect and discuss the observed features
20. Discuss the postulates of quantum mechanics.
21. Deduce time-dependent Schrodinger equation for a microscopic particle in one dimension. Extend it to the 3-dimensional case and hence solve it if potential is function of position only and deduce the time-independent Schrodinger equation.
22. Solve the problem of a quantum harmonic oscillator using the Schrodinger equation.

(2×5=10 weightage)