25003393

QP CODE: 25003393

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) SPECIAL REAPPEARANCE EXAMINATIONS, FEBRUARY 2025

Fifth Semester

CORE COURSE - PH5CRT06 - CLASSICAL AND QUANTUM MECHANICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2022 Admission Only

58C13765

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Write the Lagrange's equation of motion for conservative system.
2. What are assumptions made in deriving the Lagrange's equation from Hamilton's principle?
3. What is the Hamilton's canonical equation for the rate of change of generalized momentum?
4. Write down one difference between Hamiltonian formulism and Newtonian formulism.
5. What is Compton wavelength? What is its value for electrons?
6. Write down the expression for de-Broglie's wavelength.
7. What is the eigen value equation?
8. Outline the different postulates of quantum mechanics.
9. Define Hermitian operator.
10. What do you meant by Stationary State?
11. Explain the requirements that are imposed on a physically acceptable wave function.
12. When do you say two functions are orthonormal?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Why is it necessary to use generalized coordinates in Lagrangian Mechanics?
14. Use the principle of virtual work done to obtain the equation of motion of a simple harmonic oscillator.
15. Obtain the Hamiltonian H and the Hamilton's equations of motion of a linear harmonic oscillator.
16. Prove that at low frequency limit the planks radiation formula reduces to Rayleigh Jeans Law.
17. Under favorable circumstances the human eye can detect 10^{-18} J of electromagnetic energy. How many 600 nm photons does this represent?
18. Explain the stationary state with wave function.
19. A proton is confined to a nucleus of radius 5 fm. Estimate the minimum uncertainty in its momentum.
20. Find the value of the normalisation constant A for the wave function $\psi=A \exp(-x)$ for $0 < X<L$.
21. An electron is enclosed in a box of length 2 Aº. Determine the first three energy eigen values.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Discuss free and constraint systems illustrate with two examples. Explain how constraints are classified giving suitable examples.
23. Explain de Broglie hypothesis. Discuss the Davisson-Germer experiment of electron diffraction.
24. Explain one experiment which shows the particle behaviour of light.
25. Setup the Schrödinger equation for a particle moving in a potential.

(2×10=20)