QP CODE: 22103396

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, NOVEMBER 2022

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

2017 Admission Onwards

21FF60C5

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. What is effect of constraints on the degrees of freedom?
2. How is virtual displacement different from ordinary displacement?
3. Write the lagrangian for a simple pendulum of length l and θ is the angle made by the string with the vertical axis.
4. What is Hamilton's principle?
5. Explain Planck's hypothesis of black body radiation.
6. What is De-Broglie hypothesis?
7. Explain the term matter wave.
8. What do you mean by eigenvalues and eigenstates of a system? Explain.
9. Write down any two postulates of quantum mechanics ?
10. Write down the time dependent schordinger equation.
11. Outline the probability interpretation of the wave function.
12. What do you meant by Stationary State?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. For a particle of mass m moving in space, using cylindrical co-ordinates (r,ϕ,z) as the generalized coordinates, calculate the generalized velocity and acceleration and hence the force components.
14. What is the advantage of using Hamiltonian mechanics over Lagrangian mechanics?
15. Write down the Hamiltonian for a linear harmonic oscillator and deduce its equations of motion.
16. Explain the characteristics of Wave function.
17. What is the physical signifance of wavefunction Ψ?
18. Find the expectation value of the position of a particle enclosed in a box of length L.
19. An electron has a speed of 600 m/s with an accurancy of 0.005%. Calculate the certainty with which we can locate the position of the electron $h=6.6\times10^{-34}$ Js and $m=9.1\times10^{-31}$kg.
20. The lowest energy possible for a certain particle trapped in a certain box is 1.00eV .(a) What are the next two higher energies the particle can have? (b) If the particle is an electron , how wide is the box?
21. Write down the orthogonality condition foreigen functions.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Define the Hamiltonian and hence derive the Hamilton's canonical equations of motion.
23. Give the physical significance of Compton effect. Obtain an expression for the wavelength.
24. Describe Davisson and Germer experiments for the study of electron diffraction . What are the results of the experiments?
25. Discuss Ehrenfest theorem.

(2×10=20)