20100037

QP CODE: 20100037

Reg No : .....

Name : .....

BSc DEGREE (CBCS) EXAMINATION, FEBRUARY 2020

Fifth Semester

Core Course - PH5CRT06 - CLASSICAL AND QUANTUM MECHANICS

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

69D28116

Time: 3 Hours Maximum Marks :60

Part A

*Answer any **ten** questions.*

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

1. What is virtual displacement?
2. Write the Lagrange's equation of motion for non-conservative system.
3. Write down the Hamilton's canonical equations of motion.
4. Write down one advantage of using Hamiltonian formulism.
5. What is photoelectric effect?
6. What is a wave packet?
7. Find the eigen functions of the operator d/dx if its eigen value is 5.
8. Define Hermitian operator.
9. Write down down the expression for the expectation of the of an observable A.
10. Write down the three-dimensional time dependent Schrödinger equation for a particle moving in a potential.
11. Write down the equations of Ehrenfest theorem.
12. Explain the requirements that are imposed on a physically acceptable wave function.

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. Determine the degrees of freedom for a) Five particle moving in a plane. b) Two particles moving in a plane connected by a rod. c) A freely moving rigid body in three dimensional space.
14. Why is it necessary to use generalized coordinates in Lagrangian Mechanics?
15. Write down the Hamiltonian for a linear harmonic oscillator and deduce its equations of motion.
16. Prove that Wien's law is the high frequency approximation of Planck's law.
17. A gamma ray photon of energy 0.9 MeV is scattered through 120 deg by a free electron. Determine the energy of the scattered photon.
18. Find the de Broglie wave length of a 15 KeV electron.
19. Compare the uncertainties in the velocities of an electron and proton confined in a 1 nm box?
20. Find the lowest energy of an electron confined to a one-dimensional box of length 3 A°.
21. Write down the orthogonality condition for eigenfunctions.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Obtain the Lagrange's equation of motion from Hamilton's principle.
23. Explain de Broglie hypothesis. Discuss the Davisson-Germer experiment of electron diffraction.
24. Discuss the fundamental postulates of quantum mechanics.
25. Explain the probability interpretation of wave function. List the necessary conditions for a physically meaningful wave function. Obtain the equation of continuity.

(2×10=20)