QP CODE: 24028965

24028965

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, OCTOBER 2024

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

27EAABAF

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. What do you understand by degrees of freedom?
2. Write down the mathematical statement od d'Alembert's principle.
3. Write down the Hamilton's canonical equations of motion.
4. Write down one advantage of using Hamiltonian formulism.
5. Explain Planck's hypothesis of black body radiation.
6. Discuss the importance of Compton effect.
7. What effect on the scattering angle in the Davisson -Germer experiment does increasing the electron energy have ?
8. Compare matter waves with light waves.
9. Define Hermitian operator.
10. Write down the time dependent Schrödinger equation for a free particle in one dimension.
11. What do you meant by Stationary State?
12. Write down the expression for the energy of a particle confined to a box.

(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. Obtain the equation of motion of a one-dimensional harmonic oscillator Lagrangian formulation.

15. Use Hamilton's principle to find the equation of motion of a simple pendulum.

16. Derive a formula expressing the de Broglie wave length of an electron in terms of the potential difference V through which it is accelerated.

17. Explain the characteristics of Wave function.

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 1.05×10^4 m/s. Within an accuracy of 0.01%. Calculate the uncertainty in the position of the electron.

20. Discuss the Ehrenfest theorem.

21. Discuss the admissibility conditions on wave function.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Discuss cannonical transformations? Solve the problem of harmonic oscillator by using cannonical transformations.

23. What are the important conclusions on photoelectric effect? Give Einstein's explanations of the different effects.

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)