QP CODE: 24002427

24002427

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) SPECIAL REAPPEARANCE EXAMINATIONS, MARCH 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

2021 Admission Only

44E721BD

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Write the equation that we refer for virtual work.
2. What are assumptions made in deriving the Lagrange's equation from Hamilton's principle?
3. What is common to Hamiltonian formulism and Lagrangian formulism as compared to Newtonian mechanics?
4. Write down the transformation equation of generalized momentum for a simple pendulum in tranforming from Lagrangian to Hamiltonian.
5. Write down the Rayleigh-Jeans formula for black body radiation.
6. What is photoelectric effect?
7. Find the eigen functions of the operator d/dx if its eigen value is 5.
8. What do you meant by normalization?
9. Explain the concept of probability current density.
10. Write down the time dependent schordinger equation.
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. Bring out the meaning of holonomic and non-holonomic constraints with an example.

14. 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.

15. Define the Hamiltonian and hence derive the Hamilton's canonical equations of motion.

16. We do not consider wave nature of particles in classical mechanics. Why?

17. Find the De Broglie wave length of an electron accelerated to a potential difference of 100 volts.

18. Explain the characteristics of Wave function.

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. Explain the behaviour of an electron which is trapped in an infinite potential well.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Write down the Lagrange's equation for conserved and non- conservative system of particles. Using Lagrangian approach show that the angular momentum is conserved for planetary motion under a central conservative force.

23. Explain one experiment which demonstrates light particle interaction.

24. Define the terms (a) Wave packet, (b) Group velovity, (c) Phase velocity and (d) the physical interpretation of wave function.

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)