21101586

QP CODE: 21101586

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) SPECIAL SUPPLEMENTARY EXAMINATION, JULY 2021

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

2018 Admission Only

F71B15C0

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. What do you call a constraints that is dependent on time?
2. Define the principle of virtual work.
3. What is the Hamilton's canonical equation for generalized velocity?
4. What is common to Hamiltonian formulism and Lagrangian formulism as compared to Newtonian mechanics.
5. What are the inadequacies of classical physics?
6. Compare matter waves with light waves.
7. Write down the general eigen value equation. What are the terms involved?
8. Check wheather the momentum operator is Hermitian.
9. Give the significance of expectation value of an operator.
10. Write down the time dependent schordinger equation.
11. What do you mean by degeneracy?
12. Write down the orthogonality condition for eigen functions.

(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 simple pendulum using Lagrangian formulation.

15. Obtain the Lagrangian for a simple pendulum of length l making an angle θ with the vertical axis and then write down the Hamilton's equations.

16. In a photoelectric experiment, the slope of the cut-off voltage versus incident frequency is found to be 4.2×10^{-15} Vs. Determine the Planck's constant.

17. X-rays of wavelength 20 pm are scattered from a target. What is the wavelength of the x-rays scattered through 45^{o}?

18. Explain the characteristics of Wave function.

19. Distinguish between uncertainty in a quantum system and the error in classical observations.

20. Find the value of the normalisation constant A for the wave function $\psi=A \exp(-x)$ for $0 < X<L$.

21. Discuss the admissibility conditions on wave function.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. What is Hamilton's principle? Deduce Lagrange's equation from Hamilton's principle subject to the condition that lagrangian does not depend on time explicitly.

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. Obtain the Schrödinger equation for a particle moving in a time independent potential. What do you mean by a stationary state

(2×10=20)