QP CODE: 22100037

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Reg No : .....

Name : .....

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

E827EB1C

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Define constraint motion.
2. Give the expression for generalized force for the virtual work done of the force F.
3. How do you describe a lagrangian function?
4. What is the Hamilton's canonical equation for the rate of change of generalized momentum?
5. Discuss the importance of Compton effect.
6. Explain the term matter wave.
7. What do you mean by eigenvalues and eigenstates of a system? Explain.
8. Explain the concept of continuity equation for probability current density function?
9. Explain the physical meaning of expectation values.
10. Write down the time dependent Schrödinger equation for a free particle in one dimension.
11. What is a wave function?
12. What are the admissibility conditions of wave function?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. State and explain Hamilton's principle, bring out the nature of variation involved.

14. What is the advantage of using Hamiltonian mechanics over Lagrangian mechanics?

15. Obtain the Hamiltonian H and the Hamilton's equations of motion of a linear harmonic oscillator.

16. What are the failures of Rayleigh-Jeans formulation and how it leads to the formulation of Quantum mechanics?

17. Explain de Broglie's hypothesis. Why the wave nature of matter is not apparent in our daily observations?

18. Explain the stationary state with wave function.

19. Comapare the uncertainty in its Velocities of an electron and a proton confined in a 1.00 nm box.

20. Discuss the Ehrenfest theorem.

21. A proton in a one dimensional box has an energy of 400 KeV in its first excited state. Determine the width of the box.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Write short notes on
    a) virtual displacement and state how it is different from ordinary displacement.
    b)Virtual work done c) D'Alembert's Principle

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

24. What is meant by matter waves? Give experimental evidence in support of the concept of these waves .

25. What is a stationary state? Derive steady state form of Schrodinger equation from time dependent form.

(2×10=20)