QP CODE: 19102436

Reg No : .....

Name : .....

BSc DEGREE (CBCS) EXAMINATION, OCTOBER 2019

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

9BE6B32C

Maximum Marks: 60 Time: 3 Hours

Part A

*Answer any **ten** questions.*

Each question carries 1 mark.

1. What is the number of degrees of freedom for ten particles with ten constraints?
2. What is generalized coordinates?
3. How is virtual displacement different from ordinary displacement?
4. The Lagrangian equations of motion are _____ order differential equations.
5. Write down the Rayleigh-Jeans formula for black body radiation.
6. Write down the De- Broglie wave equation.
7. Explain the concept of probability current density?
8. What do you mean by the expectation value of an observable? Give an expression for it.
9. Uncertainty principle limits the equivalence of quantum and classical mechanics . Comment
10. What is Ehrenfest theorem?
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. Use Hamilton's principle to find the equation of motion of a simple pendulum.

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

15. Obtain the Hamiltonian H and the Hamilton's equations of motion of a simple pendulum.

16. During photoelectric emission from a material, the velocity of the emitted electrons is found to be 10^6 m/s when a light of wavelength 200 nm is used. Calculate the work function of the material.

17. An electron and a proton have the same velocity. Comapre the wavelengths and the phase and group velocities of their De Broglie waves.

18. Arrive stationary state or steady state form of Schrodinger equation.

19. What are the admissibility conditions for a wave function?

20. Obtain the equation of continuity in quantum mechanics.

21. Find the lowest energy of an electron confined to a one-dimensional box of length 3 A°.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Compare Newtonian, Lagrangian and Hamiltonian formulism and discuss the advantage and disadvantages of each.

23. Give the physical significance of Compton effect. Obtain an expression for the wavelength of a Compton scattered photon using particle conservation laws based on quantum theory.

24. Describe Davisson and Germer experiments for the study of electron diffraction . What are the results of the experiments?

25. Derive the Schrodinger's equation . What is the significance of the wave function?

(2×10=20)