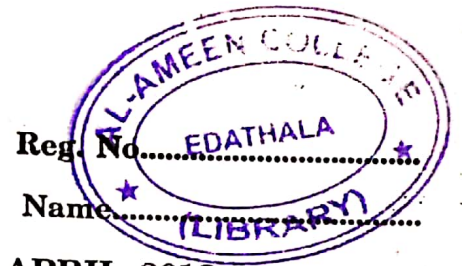


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B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2018

Fifth Semester

Core Course—CLASSICAL AND QUANTUM MECHANICS

[Common for Model I and Model II B.Sc. Physics, B.Sc. Physics EEM and B.Sc. Physics Instrumentation]

(2013 Admission onwards)

Time : Three Hours

Maximum Marks : 60

Part A

Answer all questions briefly.

Each question carries 1 mark.

1. For a harmonic oscillator the spacing of the energy levels are _____.
2. The principle of least _____ is a variational principle.
3. A body which _____ all radiations incident upon it is called a blackbody.
4. Photoelectric current _____ is proportional to the intensity of the incident light.
5. Momentum and energy are conserved in _____ collisions.
6. Davison and Germer confirmed the existence of _____ waves in 1927.
7. Probability must be a _____ real quantity.
8. The wave function as such is _____ observable.

(8 × 1 = 8)

Part B

Answer any six questions.

Each question carries 2 marks.

9. State the principle of virtual work.
10. How degrees of freedom are different from constraints ?
11. Explain the significance of zero point energy.
12. State de Broglie hypothesis.
13. What are operators ?

Turn over

14. Explain the time-energy uncertainty.
15. Distinguish between group velocity and phase velocity.
16. Briefly explain degeneracy of wave functions.
17. What is energy Eigen values ?
18. State the physical significance of commutation relations.

(6 × 2 = 12)

Part C

*Answer any four questions.
Each question carries 4 marks.*

19. With the support of D'Alembert's principle arrive at Hamilton's principle.
20. Obtain the solution for one dimensional harmonic oscillator problem.
21. Determine the wavelength and frequency 100 MeV photon.
22. Calculate the de Broglie wavelength of a 46 gram golf ball with a velocity of 30m/s.
23. A microscope using photons is employed to locate an electron in an atom with in a distance of 0.02 /nm. Calculate the uncertainty in the momentum of the electron located in this way.
24. An Eigen function of the operator (d^2/dx^2) is $\psi = e^{2x}$. Find the corresponding Eigen value.

(4 × 4 = 16)

Part D

*Answer any two questions.
Each question carries 12 marks.*

25. Describe the generalized co-ordinates and velocities. Obtain Lagrange's equations for general systems.
26. What are matter waves ? Describe the Davisson and Germer experiment to confirm the existence of matter waves.
27. Calculate the values of the energy of a particle in a one dimensional box. Indicate graphically the first three wave funttions for such a particle.
28. Discuss the general thgory of orbital angular mormentum.

(2 × 12 = 24)