



Date: 03-05-2016

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

PART – A (10 x 2 = 20 Marks)

Answer **ALL** the questions:

1. Define work function.
2. State Bohr's quantisation of angular momentum.
3. What do you mean by group velocity?
4. Show that momentum operator is a self adjoint operator.
5. Show that $[L^2, L_z] = 0$.
6. Express the radial equation of hydrogen atom.
7. Two electrons each of velocity $0.8c$ move towards each other. Find the relative velocity of one electron with respect to the other.
8. What is four dimensional Euclidean space?
9. At what speed does the kinetic energy of a particle equal its rest energy?
10. State principle of equivalence in general theory of relativity.

PART – B (4 x 7.5 = 30 Marks)

Answer any **FOUR** questions:

11. State Heisenberg's uncertainty principle and use it to find the ground state energy of hydrogen atom.
12. Derive the probability conservation equation in quantum mechanics.
13. Solve for the energy eigen values of a one dimensional simple harmonic oscillator.
14. Explain the aberration of light from stars.
15. Obtain the transformation equations for relativistic force.
16. Derive Lorentz transformation equations between 2 different frames of reference in relative motion along x - axis

PART – C (4 x 12.5 = 50 Marks)

Answer any **FOUR** questions:

17. (i) What are the drawbacks of classical physics in explaining black body radiation spectra?
(ii) Explain black body radiation using Planck's quantum hypothesis.
18. State and prove Ehrenfest's theorems.
19. Obtain the bound state energy values of a particle of mass m confined to a one dimensional square well potential of depth V_0 in the region $x \leq |a|$.
20. Express L^2 and L_z operators in spherical polar coordinate system and solve them to find their eigen value spectrum.
21. Explain (i) Non-inertial frames (ii) Equality of inertial and gravitational mass (iii) Gravitational Red Shift.
22. (i) State the postulates of quantum mechanics.
(ii) Prove that the eigen values of a Hermitian operator are real.

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