B.Sc. DEGREE EXAMINATION,APRIL 2019
III Year VI Semester
Relativity and Quantum Mechanics

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. If a particle could move with the velocity of light, how much kinetic energy would it possess?
2. At what condition the Lorentz transformation reduces to Galilean transformation?
3. Give any two properties of matter waves.
4. State Heisenberg uncertainty principle.
5. Calculate the wavelength of an electron moving with 1% of the speed of light.
6. How do you define the expectation value of a dynamic variable?
7. State the significance of zero point energy.
8. What is the probability of a particle inside the box of length L?
9. Name the two techniques commonly employed to evaluate the scattering amplitude.
10. When are the differential cross sections equal to c.m frame and laboratory frame?
11. If 1gm of a substance is fully converted into energy, Calculate the energy produced?
12. An Eigen function of the operator d^2/dx^2 is e^x . Find the Eigen value.

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. Describe Michelson - Morley experiment.
14. Using Lorentz transformation deduce the law of addition of velocities and discuss.
15. Arrive the relation between group velocity and phase velocity.
16. Bring out the significance of wave function. Also discuss about Orthogonal and normalized wave function.
17. Establish Schrodinger equation for a linear harmonic oscillator.
18. Find the relation between the kinetic energy in centre of mass coordinate system and laboratory coordinate system.
19. Show that the momentum operator $\frac{\mathbf{h}}{\mathbf{i}}\frac{\partial}{\partial \mathbf{x}}$ is Hermitian.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Deduce the formula for relativistic variation of mass with velocity. Briefly explain its significance.
21. Describe Davisson and Germer experiment for study of electron diffraction. What are the results of the experiment?
22. Derive time independent Schrodinger equation.
23. Obtain free particle solution of Schrodinger's equation.
24. Transform Differential cross section from c.m frame to laboratory frame.

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