Long answer Questions

1. What is Galilean transformation? Derive Galilean transformation equations. Prove that the laws of mechanics are identical in all inertial frames.
2. Show that length and Newton's second la of motion are invariant under Galilean transformation. Show that velocity is not invariant under the same transformation.
3. State the postulates of special theory of relativity. Derive the Lorentz transformation equations.
4. State the expression for the total force acting on a particle in a uniformly rotating frame of reference and explain in detail the terms contained in it. Which are the fictitious forces in this expression?
5. What is simple harmonic motion? What are the characteristics of simple harmonic motion?
6. Solve the differential equation of a damped harmonic oscillator. Investigate the conditions under which the oscillations are said to be under damped, over damped and critically damped.
7. Explain the electrical analogy of mechanical oscillator and compare the two oscillators.
8. What is photo-electric effect? Discuss the laws of photo-electric emission of electrons and explain Einstein's equation regarding the photo-electric effect?
9. What are matter waves? Write the de-Broglie concept of matter waves? How it is experimentally verified? (Davisson and Germer)
10. (a) State and explain Heisenberg's uncertainty principle. (b) Give the physical signification of wave function. Derive Schrodinger wave equation.
11. Describe young's double slit experiment. Derive an

expression for the intensity at a point in the region of superposition of two coherent waves of the same period and wavelength.

12. Describe and examine the formation of newton rings in reflected monochromatic light. Prove that in reflected light diameters of dark rings are proportional to the square root of the natural numbers and that of bright rings are proportional to the square root of the odd numbers.

13. Explain briefly the working of the Michelson's interferometer?. What are its applications?

14. Describe Fraunhofer diffraction due to single slit and deduce the positions of maxima and minima. Draw the representative graph of the intensity distribution.

15. (a) Describe the construction and working of Nicol prism. Explain how it is used as polariser and an analyser.

(b) What is meant by plane-polarised circularly polarised and elliptically polarised light? Show that plane polarised and circularly polarised lights are the special cases of elliptically polarised light.