Name of the Program: **B.Tech.** *Semester: II*

Name of the Course: **Engineering Physics** *Course Code: TPH-201*

Time: 3 Hours **Maximum Marks: 100**

Note:

(i) This question paper contains five questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) The total marks assigned to each question are twenty.

Q 1	**Attempt any two questions of choice from a, b, and c. (10 x 2 = 20 Marks)**	6
(a)	Derive the expression for the diameter of the bright ring of order n in Newton's rings experiment immersed in a liquid of refractive index μ.	CO 1
(b)	A convex lens and glass plate combination is illuminated by monochromatic light. The diameter of the 10^{th} dark ring is measured in reflected light and is found to be 5cm. Find the wavelength of light used. The radius of curvature of the lower face of the lens is 90 cm.	
(c)	Describe Fraunhofer diffraction due to a single slit and deduce the positions of the maxima and minima. Show the relative intensity of successive maxima.	
Q 2	**Attempt any two questions of choice from a, b, and c. (10 x 2 = 20 Marks)**	
(a)	What is the working principle of LASER? Derive the relation between Einstein's coefficients.	CO 2
(b)	Explain the construction and working of the Ruby laser.	
(c)	Write short notes on (i) numerical aperture (NA), (ii) acceptance angle, and (iii) acceptance cone. Optical fiber has an NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for fiber in water, which has a refractive index of 1.33.	
Q 3	**Attempt any two questions of choice from a, b, and c. (10 x 2 = 20 Marks)**	
(a)	Apply Lorentz transformation to derive the expression for length contraction and time dilation.	CO 3
(b)	What is the length of a meter stick moving parallel to its length when its mass is 3/2 times its rest mass?	
(c)	Derive the formula for relativistic variation of mass with velocity.	
Q 4	**Attempt any two questions of choice from a, b, and c. (10 x 2 = 20 Marks)**	
(a)	Discuss the idea of matter wave. Derive an expression for the de Broglie wavelength of electron.	CO 4
(b)	An electron is bound in one-dimensional infinite potential well of width 1×10^{-10} m. Find the energy values in the ground state and the first two excited states.	
(c)	What is the physical significance of wave function Ψ? Derive time-dependent Schrodinger equation.	
Q 5	**Attempt any two questions of choice from a, b, and c. (10 x 2 = 20 Marks)**	
(a)	Derive Maxwell's equations in differential form and explain their physical significance.	CO 5
(b)	Show that the electromagnetic waves propagate in free space with the velocity of light.	
(c)	What do you mean by the superconducting state of a material? Explain type I and type II superconductors.	