Time: 2Hours **Marks: 60**

N. B. 1) Question no 1 is compulsory
2) Attempt any three questions from remaining three questions.
3) Assume suitable data wherever required
4) Figures on the right indicates marks

1		Attempt any five	15
	a	In Newton's ring experiment the diameter of 5^{th} dark ring is 0.5cm, calculate the diameter of 20^{th} dark ring.	
	b	What is meant by absent spectra? Write the condition of absent spectra.	
	c	A fiber cable has an acceptance angle of 30^0 and a core refractive index is 1.4. Calculate the refractive index of cladding.	
	d	What is resonance cavity? Explain its importance in Lasers.	
	e	What is the wave function of matter wave? Explain its physical significance	
	f	How do you measure phase difference between two A.C. signals by CRO?	
	g	Define superconductivity and explain the statement, "Diamagnetism is the test of superconductivity".	
2	a	For Newton's ring, prove that diameter of nth dark ring is directly proportional to the square root of natural number.	5
		If the diameter of n^{th} and $(n+10)^{th}$ Newton's dark ring are 4mm and 8mm respectively. Determine the wavelength of light used if the radius of curvature is 2 m.	3
	b	Differentiate between Step Index and graded Index optical fiber and derive an expression for numerical aperture of step index optical fiber.	7
3	a	How is laser different than that of ordinary source of light? With neat diagram explain the construction and working of Nd-YAG Laser.	8
	b	Why are the fringes straight in the interference pattern of wedge shaped film? Derive an expression for fringe width.	7
4	a	What is grating element? A monochromatic light of wavelength 5×10^{-5} cm falls normally on a grating of 2cm wide. The first order maxima is produced at 18^0 from the normal. What are the total number of lines on the grating?	5
	b	What is Heisenberg's uncertainty principle? Prove it using single slit electron diffraction.	5
	c	What are critical temperature and critical magnetic field of superconducting material? The transition temperature for Pb is 7.2 k. At 5 k it losses the superconducting property if subjected to magnetic field of 4×10^4A/m. Find the critical magnetic field at 0k.	5
5	a	For plane transmission grating, prove that the condition of diffraction maximum is $d\sin\Theta=n\lambda$, n=0, 1, 2, 3……	5
	b	Derive one dimensional time independent Schrodinger wave equation.	5
	c	With neat diagram, explain the construction and working of electron microscope.	5
6	a	An electron has momentum of 5×10^{-14} kg-m/s with an accuracy of 0.05%. Find the minimum uncertainty in the location of electron.	5
	b	With neat diagram explain the construction and working of Cathode Ray Tube.	5
	c	What are Nano materials? Explain one of the method of its production in detail.	5

****