

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 5th dark ring is 0.5cm, calculate the diameter of 20th 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° 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 nth 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° 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 4×10^4 A/m. Find the critical magnetic field at 0k. 5
- 5** a For plane transmission grating, prove that the condition of diffraction maximum is $d \sin \theta = n\lambda$, $n=0, 1, 2, 3, \dots$ 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
