

Duration: 2 hours

Total Marks: 60

- N.B 1 Question no 1 is compulsory.
 2 Attempt any three questions from Q.2 to Q.6
 3 Use suitable data wherever required.
 4 Figures to the right indicate full marks.
- Q.1 Attempt any five of the following. 15
- How will you test the optical flatness of surface by interference?
 - What is dispersive power? Write the formula for dispersive power of diffraction grating
 - Calculate the refractive indices of core and cladding material of a fiber from following data, $NA = 0.22$ $\Delta = 0.012$
 - Explain the terms: i) Metastable states. ii) Pumping iii) Population inversion
 - How do you measure phase difference between two A.C. signals by CRO?
 - Why is the wave nature of De-Broglie wave not apparent to daily life?
 - How can Maglev train have very high speed?
- Q.2 a Show that diameter of Newton's nth dark ring is proportional to the square root of natural number. In Newton's ring experiment the diameter of 5th dark ring is 0.336cm and that of 15th dark ring is 0.590 cm. Calculate the radius of curvature of Plano convex lens if wavelength of light used is $5890\text{\AA}$ 4+4
- b What are the advantages of optical fiber? Explain the use of optical fiber in communication system. 7
- Q.3 a What is Holography? Explain the construction and reconstruction of Hologram with neat diagram 8
- b Explain the interference in thin film of constant thickness and derive the conditions of maxima and minima for interference. 7
- Q.4 a Calculate the maximum order of diffraction maxima seen from plane transmission grating having 2500 lines per inch if light of wavelength $6900\text{\AA}$ falls normally on it 5
- b Derive Schrodinger's time independent equation 5
- c Explain the phenomena of superconductivity? Show that in superconducting state the material is perfectly diamagnetic. 5
- Q.5 a A grating has 6000 lines per cm. Find the angular separation between two yellow lines of mercury of wavelengths $5770\text{\AA}$ and $5791\text{\AA}$ in the second order. 5
- b Show that the energy of an electron in a box varies with square of natural number. 5
- c Explain the construction and working of Atomic Force Microscope. 5
- Q.6 a With single slit electron diffraction experiment prove Heisenberg's uncertainty principle 5
- b Explain the magnetostatic focusing system and calculate the pitch of helix 5
- c What is top down and bottom up approach of preparing nanomaterials. Explain one of the methods on detail. 5
