

[Time: 2 Hours]

[Marks:60]

Please check whether you have got the right question paper.

- 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
- A Why the Newton's rings are circular and fringes in wedge shaped film are straight?
- B What is grating and grating element?
- C The core diameter of multimode step index fibre is $50 \mu\text{m}$. The numerical aperture is 0.25. calculate the number of guided modes at an operating wavelength of $0.75 \mu\text{m}$.?
- D What is a population inversion state? Explain its significance in the operation of LASER.
- E What is divergence of a vector field? Express it in Cartesian coordinate system.
- F What do you mean by thin film? Comment on the colors in thin film in sun light
- G An electron is accelerated through a potential difference of 18 kV in a color TV cathode ray tube. Calculate the kinetic energy and the speed of the electron.
- Q.2** A Derive the conditions for maxima and minima due to interference of light transmitted from thin film of uniform thickness. 08
- B Differentiate between step index and graded index fibre. 07
- An optical fibre has a numerical aperture of 0.20 and a refractive index of cladding is 1.59. Determine the core refractive index and the acceptance angle for the fibre in water which has a refractive index of 1.33.
- Q.3** A Explain the experimental method to determine the wavelength of spectral line using diffraction grating. 08
- What is the highest order spectrum which can be seen with monochromatic light of wavelength 6000 \AA by means of a diffraction grating with 5000 lines /cm?
- B Explain construction and working of He:Ne laser with neat label diagram. 07
- Q.4** A Explain Cylindrical co-ordinate system. State the transformation relation between Cartesian and Cylindrical co-ordinates. 05
- B Explain the concept of electrostatic focusing in electron optics. 05
- C Two optically plane glass strips of length 10cm are placed one over the other. A thin foil of thickness 0.01 mm is introduced between them at one end to form an air film. If the light used has wavelength 5900 \AA find the separation between consecutive bright fringes. 05
- Q.5** A With Newton's ring experiment explain how to determine the refractive index of liquid? 05
- B Using Spherical co-ordinate systems calculate the area of a disc of radius 2cm. 05
- C What are different techniques to synthesis nanomaterial? Explain one of them in detail. 05
- Q.6** A With neat diagram explain construction and working of Scanning electron microscope. 05
- B Explain the construction and reconstruction of hologram with neat diagram. 05
- C An electron is accelerated through a potential difference of 5 kV and enters a uniform magnetic field of 0.02 wb/m^2 acting normal to the direction of electron motion. Determine the radius of the path. 05