

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 centre of interference pattern (reflected) is dark?
- B What is Rayleigh's criterion of resolution? Define resolving power of a grating?
- C Calculate the V number of an optical fibre having numerical aperture 0.25 and core diameter $20 \mu\text{m}$, if its operating wavelength is $1.55 \mu\text{m}$
- D What is pumping in LASER? Give the types of pumping.
- E Show that the divergence of the curl of a vector is zero.
- F Determine the magnetic field required to bend a beam consisting of electrons of speed $3 \times 10^7 \text{m/s}$ in a circle of radius 5 cm.
- G What will be the fringe pattern if wedge shaped air film is illuminated with white light?
- Q.2A** Obtain the condition for maxima and minima of the light reflected from a thin transparent film of uniform thickness. Why is the visibility of the fringe much higher in the reflected system than in the transmitted system? 08
- B** What is Numerical aperture? Explain the use of optical fibre in temperature sensor. 07
The core diameter of a 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 $0.75 \mu\text{m}$.
- Q.3A** Explain the experimental method to determine the wavelength of spectral line using diffraction grating. 08
A diffraction grating has 5000 lines /cm and the total ruled width is 5cm. Calculate dispersion for a wavelength of 5000\AA in the second order.
- B** Explain construction and working of Nd: YAG laser. 07
- Q.4A** Explain Spherical co-ordinate system. State the transformation relation between Cartesian and Spherical coordinates. 05
- B** Explain construction and working of cathode ray tube. 05
- C** A wedge shaped air film having angle of 40 seconds is illuminated by monochromatic light. Fringes are observed vertically through a microscope. The distance between 10 consecutive dark fringes is 1.2cm. Find the wavelength of monochromatic light used. 05
- Q.5A** With neat diagram explain construction and working of Atomic force microscope. 05
- B** Derive Maxwell's two general equations in integral and differential form. 05
- C** An electron is accelerated through a potential difference of 5 kV and enters a uniform magnetic field of 0.02wb/m^2 acting normal to the direction of electron motion. Determine the radius of the path. 05
- Q.6A** What are different techniques to synthesis nonomaterial? Explain one of them in detail. 05
- B** What is holography? Differentiate between holography and photography. 05
- C** Describe in detail the concept of anti reflecting film with a proper ray diagram. 05