Q.P. Code :09911

[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 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 μm, if its operating wavelength is 1.55 μm

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 $3x10^7$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.2 A 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 μm. The numerical aperture is 0.25. Calculate the number of guided modes at an operating wavelength of 0.75 μm.

Q.3 A 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 5000A° in the second order.

B Explain construction and working of Nd: YAG laser. **07**

Q.4 A 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.5 A 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 0.02 wb/m^2 acting normal to the direction of electron motion. Determine the radius of the path. **05**

Q.6 A 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**
