Roll No. ..... Total Pages : 04

BT-3/D-23 43144

OPTICS AND WAVES

BS-201A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section I

1. (a) Derive the set of Maxwells equations in integral form from fundamental laws for a good conductor. **5**

(b) Explain the relation between field theory and circuit theory and thus obtain an expression for Ohm's law. **10**

2. (a) Deduce the expression for electromagnetic wave equation for conducting and perfect dielectric medium. **7**

(b) A 6580 MHz uniform plane wave is propagating in a material medium of $\varepsilon r = 2.25$. If the amplitude of the electric field intensity of lossless medium is 500 V/m. Calculate the phase constant ,propagation constant, velocity, wavelength and intrinsic impedance. **8**

Section II

3. (a) Explain, how interference fringes are produced using biprism. **7**

(b) Describe Fresnel's biprism method for the determination of wavelength of light. Obtain an expression for band width of interference fringes produced by biprism. **8**

4. (a) What are Newton's rings ? Show that the radii of the dark rings are in the ratio of square root of natural numbers. **7**

(b) Verify the law of reflection for a spherical wavefront incident on a plane surface using Huygens' wave theory. **8**

Section III

5. (a) Describe the Fraunhofer diffraction due to single slit for central maxima and prove that the relative intensities of the successive maxima are nearly 1 : 1/22 : 1/61.

(b) Explain the following in brief :

(i) Secondary Maxima and Secondary Minima

(ii) Dispersive Power. **15**

6. (a) Define polarization. What are the different types of wave polarization ? Explain them with mathematical expression. **8**

(b) Describe, how to produce polarized light by reflection ? Explain the construction and working of Laurent's half shade polarimeter. **7**

Section IV

7. (a) Using the correct expressions, infer the relation between Einstein's coefficient of spontaneous and stimulated emissions. **7**

(b) With the help of an energy diagram, illustrate the construction and working of a four level solid state laser, where the Nd3+ ions act as the active centers. **8**

8. (a) Outline the principle, construction and working of an Nd-YAG laser. List any three advantages of Nd-YAG laser. 7

(b) List the different pumping schemes for creating population inversion. Explain the principle, construction and working of a semiconductor diode laser. 8