B.A./B.Sc. (General) 3rd Semester
1128
PHYSICS
Paper —(B : Optics & Lasers—I)

Time Allowed : Three Hours]   **[Maximum Marks : 22**

Note :— Attempt **Five** questions in all, selecting **two** questions each from Unit–I and Unit–II. Unit–III (Q.No. 7) is compulsory. Use of non-programmable calculators and log tables are allowed.

UNIT—I

1. (a) Explain the principle and working of Michelson interferometer.

    (b) Calculate the separation between the coherent sources formed by biprism whose inclined faces make an angle of 1° with its base. The slit source being 10 cm from biprism and μ of biprism = 1.5.   3,1.5

2. (a) Explain the phenomenon of interference of light. Calculate the fringe width and hence show that the dark fringes are equidistant like the bright fringes.

    (b) Two straight and narrow parallel slits 3 mm apart are illuminated with a monochromatic source having $\lambda = 5.9 \times 10^{-5}$ cm. Fringes are obtained at a distance of 30 cm from the slits. Find the width of fringes.   3,1.5

3. (a) Explain the formation of Newton's rings by transmitted light. Derive an expression for n^{th} dark ring.

   (b) What are advantages of Fabry-Perot interferometer over Michelson's interferometer. 3,1.5

UNIT—II

4. (a) What is Zone plate ? Give its construction and working. Show that it is equivalent to a multiple foci convex lens.

   (b) Light of wavelength 600Å passes through a narrow circular aperture of radius 0.09 cm. At what distance along the axis will the first maximum intensity be observed ? 3,1.5

5. (a) Define Resolving Power. Derive an expression for the resolving power of grating.

   (b) A slit of width 0.002 cm is placed immediately in front of a lens of focal length 60 cm. It is illuminated normally by a parallel beam of light of wavelength 5×10^{-5} cm. Calculate the distance between the central and the first dark band of diffraction pattern on a screen placed at 60 cm from the lens. 3,1.5

6. (a) What is double refraction ? How will you get circularly and elliptically polarised light ?

   (b) Explain the uses of Polaroids. 3,1.5

UNIT—III

7. Attempt any Eight Parts :—

   (i) Define Coherence time.

   (ii) What happens when the slits of Young's double slit experiment are illuminated by light ?

(iii) Why central point in Lloyd's mirror method is a dark point ?

(iv) What would be tne thickness of the film which should be coated on a surface to make it non-reflecting ?

(v) Why can we not get diffraction from a wide slit illuminated by monochromatic light ?

(vi) A diffraction grating can be called an interference grating. Explain.

(vii) What is nature of diffraction pattern obtained due to diffraction at a circular aperture ?

(viii) What is Rayleigh Criterion of resolution ?

(ix) Explain why light can be Polarised but sound can not be Polarised.

(x) Can our eye distinguish polarised light from the unpolarised light ? $\frac{1}{2} \times 8 = 4$