(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 1 7 2 4 8

Exam. Code : 0 0 0 3

B.A./B.Sc. (General) 3rd Semester

(2124)

PHYSICS

Paper—B : (Optics & Lasers-I)

Time Allowed : Three Hours] **[Maximum Marks : 44**

Note :— Attempt **FIVE** in all selecting **TWO** questions each from Unit-I, Unit-II and Unit-III is compulsory. Use of Non-Programmable calculators and log tables is allowed.

UNIT—I

1. (a) Describe Fresnel's biprism method of finding the wavelength of light. Give theory of the method. Explain what happens when light is used to illuminate the slit.

   (b) In a Fresnel's biprism experiment, the focal plane of the eye-piece is at 1 m from the slit. The slit is illuminated with sodium light and the fringe width is found to be 0.172 mm. A lens of short focal length is placed between the biprism and the eye-piece. The lens, when adjusted near the biprism produces the two images of the slits separated by 4.34 mm and when adjusted near the eye-piece produces two images of the slit separated by 2.71 mm. Calculate the wavelength of the sodium light. 6,3

2. (a) Discuss the phenomenon of interference in thin films. Obtain the condition for maxima and minima.

(b) A parallel beam of sodium light strikes an oil film (n=1.40) floating on water (n = 1.33). When viewed at an angle of 30°, from the normal, the sixth dark fringe is seen. Find the thickness of the film. Given λ = 589 nm. 6,3

3. (a) Describe the principle, construction and working of Michelson interferometer. What type of fringes do you get in it ? Name three applications of Michelson interferometer.

(b) What is thickness of a non-reflecting film in terms of λ? 7,2

UNIT—II

4. (a) What is the difference between positive and negative zone plate ?

(b) Why the diffraction of sound is more evident in daily experience than that the light waves ? 6,3

5. (a) Explain Rayleigh's criterion for resolution and discuss it in relation to the resolving power of a microscope.

(b) A microscope with oil immersion objective can just resolve 40 lines per cm. Wave length of light is 4000 A°. Calculate the numerical aperture of the objective required to just resolve the lines. 5,4

6. (a) State and prove Malus Law. If the angle between a polarizer and analyser is 60°, what will be intensity of light transmitted, having original intensity I_0 incident on the polarizer ?

(b) What is difference between positive and negative crystals ? 6,3

UNIT—III

7. Attempt any **eight** questions:

(a) Explain why colour of sky is Blue.

(b) The light waves are said to be transverse. What is the evidence for this ?

(c) Why do we call Fresnel's zones as half period zones ?

(d) Can diffraction occur for virtual images ? Why ?

(e) Can interference occur with longitudinal waves ? Explain.

(f) Why is central fringe in the Newton's Ring experiment dark, when we view the interference pattern by reflection ?

(g) Give two conditions for sustained interference pattern.

(h) What is the cause of luminous border surrounding the profile of a mountain just before the sunrise or just after the sun set ?

(i) If Young's double slit apparatus is immersed in water, what will happen to fringe width ?

(j) A double slit interference experiment is carried out with monochromatic light in air. What will be change in the interference pattern, when the whole apparatus is immersed in water ? $1 \times 8 = 8$