

Roll No. ....

Total Pages : 4

**GSM/D-20**

**921**

**WAVE AND OPTICS-I**

Paper - VI (PH-302)

*Time allowed : 3 Hours*

*Maximum Marks : 40*

**Note :** Attempt any five questions, selecting at least one question from each unit. Question No. 1 is compulsory. Use of Scientific (non-programmable) calculator is allowed.

**Compulsory Questions**

1. (i) How can we locate central fringe in biprism? 2
- (ii) Why do we use an extended source to produce colours in thin films? 2
- (iii) What is condition of diffraction? Explain the difference between interference and diffraction. 2
- (iv) Distinguish between dispersive power and resolving power of a grating. 2

## UNIT-I

2. (i) Describe the method to find the thickness of a thin transparent sheet using biprism. Can you find thickness of a thick sheet also ? 6
- (ii) Two slits in Young's apparatus are 0.2mm apart. The interference fringes for light of wavelength  $6000\text{\AA}$  are formed on screen 80 cm away. How far is the second dark band from the central fringe ? 2
3. (i) How will you determine the wavelength of monochromatic light by means of Lloyd mirror? Write the difference between Biprism and Lloyd mirror fringes. 6
- (ii) The distance between the slit and the biprism and screen is 60 cm each. The angle of biprism is  $179^\circ$  and its refractive index is 1.5. If the distance between successive fringes is 0.0150 cm. Calculate wavelength of light used. 2

## UNIT-II

4. What are non-reflecting films? How they are produced. Derive expression for reflectivity in terms of wavelength and refractive index. 8

5. (i) Explain the formation of Newton's rings by reflected light. How can these are used to find the refractive index of a transparent film. 6
- (ii) A thin film of a material, whose refractive index is 1.45. on being introduced in one of the arms of Michelson's interferometer, causes a shift of 7 fringes. If wavelength of light used is  $5893\text{\AA}$ . Calculate the thickness of the film. 2

### UNIT-III

6. What is zone plate ? How it is constructed ? Discuss its working as lens. What is phase reversal zone plate ? 8
7. (i) Describe analytically the phenomenon of Fresnel's diffraction at a circular aperture. 6
- (ii) Determine the radius of the first half period zone of a zone plate which behaves as a convex lens of focal length 50 cm for a wavelength of  $5000\text{\AA}$ . 2

### UNIT-IV

8. (i) Discuss Fraunhofer diffraction at double slit. Find the positions of maxima and minima. 6

(ii) In a Fraunhofer diffraction due to a narrow slit is placed 1m away from the lens to obtain pattern. If slit width is 0.1 mm and first minima lies 4 mm on either side of the central maxima, find wavelength of light used. 2

9. What is plane diffraction grating? Discuss its theory and derive conditions for secondary maxima and minima. 8