

Roll No. ....

(12/24)

**5198**

**B.Sc. EXAMINATION**

(Third Semester)

**PHYSICS**

**PH-302**

**Wave and Optics-I**

*Time : Three Hours*

*Maximum Marks : 40*

**Note :** Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks. Use of non-programmable calculator is allowed.

**(Compulsory Question)**

1. (a) How can we locate the central fringe in Fresnel Biprism Experiment ? 1½

- (b) What will happen if air is replaced by some transparent liquid in Newton's Ring Experiment ? 1½
- (c) In what respect a zone plate is different from a convex lens ? 1½
- (d) What is the dispersive power of a grating ? On what factors does it depend ? 1½
- (e) How does Resolving power of a telescope change with change of  $\lambda$  of light used ? 1
- (f) What is the relation between phase difference and path difference ? 1

### Unit I

2. (a) Describe Fresnel's Biprism experiment to determine the thickness of a thin sheet of transparent material. 6

- (b) A Biprism of Angle  $1^\circ$  and Refractive index 1.5 is placed at a distance of 40 cm from the slit. Find the fringe width on a screen placed at a distance of 60 cm from the biprism when wavelength of light used is  $5893 \text{ \AA}$ . 2

3. (a) Describe the Lloyd's Mirror experiment to obtain the interference Fringes. Give the conditions Bright and Dark Fringes in this method. 5
- (b) Describe Stoke's Law of Reflection. 3

### Unit II

4. (a) Explain in details the conditions for maxima and minima for interference by Transmitted light in Newton's ring experiment and hence calculate wave length of light. 6

- (b) A soap film of  $\mu = \frac{4}{3}$  is illuminated by white light incident at an angle of  $30^\circ$ . The transmitted light is examined by a spectroscope and bright band is found to be of wavelength  $6 \times 10^{-5}$  cm. Find the thickness of film. 2

5. Describe the construction of a Michelson's Interferometer and explain its application to : 8

- (a) Standardization of a meter  
(b) Determination of wavelength.

### Unit III

6. Discuss the phenomenon of Diffraction at a straight edge and find the position of maxima and minima. 8

7. (a) What is a Zone Plate ? How is it formed ? Show that a zone plate has a multiple focii. 6  
(b) Find the Radii of first three clear half period zones of a zone plate designated to bring a parallel beam of light of wavelength  $6000 \text{ \AA}$  to its focus at a distance of 2 m. 2

### Unit IV

8. Describe analytically the Fraunhofer diffraction at a Double Slit. Find the conditions for the missing orders in the spectrum. 8  
9. (a) Explain how a plane transmission grating can be used to determine the wavelength of monochromatic light. 3



(b) What is Resolving Power ? Discuss Rayleigh's criterion of Resolution. 3

(c) Find the missing orders in the diffraction pattern of a Double slit if the slit width is 0.16 mm and opaque width is 0.8 mm. 2

#### Unit IV

8. Describe analytically the Fraunhofer diffraction at a Double Slit. Find the conditions for the missing orders in the spectrum.

9. (a) Explain how a plane transmission grating