SET A

Roll No. ……..

Unique Paper Code : **42224412**

Name of Paper : **Waves and Optics**

Name of Course : **B.Sc. Prog.-CBCS_Core**

Semester : **IV**

Duration : **2 Hours** Maximum Marks: 75

(Write your Roll No. on the top immediately on receipt of this question paper)

Answer any **four** of the six questions. Each question carries equal marks.

1. What are Lissajous figures? Draw graphically the Lissajous figure for the following:

$$x = 5\ \cos \omega t$$
$$y = 10 \cos\ (\omega t + {}^{\pi}/_{3})$$

2. Explain the Fresnel's Biprism experiment and derive the conditions of maxima and minima of intensity for a biprism. How do you determine the separation 'd' between the two virtual sources in this experiment? In a Fresnel Biprism experiment, the fringe width observed is 0.087 mm. What will be the fringe width if the slit to biprism distance is reduced to half the original distance?

3. Explain the formation of Newton's rings. Derive an expression for the diameter of Newton's rings as seen from transmitted side. In a Newton's rings experiment, the diameter of the 10^{th} dark ring in the reflected system changes from 1.4 cm to 1.27 cm when a liquid is introduced between the lens and glass plate. Calculate the refractive index of the liquid.

4. Derive the expression for intensity of Fraunhoffer diffraction due to a single slit illuminated by a parallel beam of monochromatic light. Discuss and draw the intensity distribution.

5. Show that the intensity due to the entire unobstructed wavefront in Fresnel diffraction is given by $m_1^2/4$ where m_1 is the amplitude contribution from the first Fresnel half period zone. Discuss the theory of zone plate and show that it has multiple foci.

6. What are the different methods of producing plane polarised light? Explain briefly. What is a Nicol prism and how is it used to produce polarised light?