



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc. DEGREE EXAMINATION – PHYSICS**

**FIFTH & THIRD SEMESTER – NOVEMBER 2017**

**PH 5506 / PH 5509 / PH 3500 – OPTICS**

**(UPTO 11 BATCH)**

Date: 03-11-2017

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

**Part – A**

**Answer ALL Questions**

**(10 x 2 = 20 marks)**

1. What are nodal planes?
2. State the cause of coma in optics.
3. What are coherent sources?
4. A biprism is placed 5 cm from a slit illuminated by sodium light of wavelength  $5890 \text{ \AA}$ . The width of the fringes obtained on a screen 95 cm from the biprism is  $10 \times 10^{-2}$  cm. What is the distance between the two coherent sources?
5. Distinguish between Fresnel and Fraunhofer diffraction.
6. What is the radius of first zone in a zone plate of focal length 32 cm for light of wavelength  $5000 \text{ \AA}$ ?
7. State the significance of Brewster window.
8. Define specific rotation.
9. What is resonance?
10. Distinguish between spontaneous and stimulated emission.

**Part – B**

**Answer ANY FOUR Questions**

**(4 x 7.5 = 30 marks)**

11. Obtain the focal length and positions of the unit planes for a combination of two thin lenses of focal lengths  $f_1$  and  $f_2$  separated by a distance  $t$ .
12. Discuss the theory of interference due to reflected light by thin films.
13. Derive the expression for resolving power of a prism.
14. Explain the construction of nicol prism and its application.
15. Discuss Einstein's theory of stimulated emission and show the existence of stimulated emission of radiation.

16. (a) Obtain the condition for achromatism of two thin lenses separated by a finite distance.
- (b) Two thin lenses, made of same material, of focal length  $f_1$  and  $f_2$  separated by a distance  $d$  have an equivalent focal length 50 cm. The combination satisfies the conditions for achromatism and minimum spherical aberration. Find the values of  $f_1$ ,  $f_2$  and  $d$ . (8 + 4.5)
17. (a) Describe Michelson's interferometer. Explain how circular, straight and white light fringes are formed.
- (b) Explain how Michelson's interferometer is used to determine the wavelength of monochromatic light. (10 + 2.5)
18. (a) What is a plane transmission grating? Discuss its theory for oblique incidence.
- (b) Explain how plane transmission grating is used to find the wavelength of monochromatic light. (8 + 4.5)
19. (a) Discuss the theory of elliptically and circularly polarized light.
- (b) Discuss about quarter wave plate. (10 + 2.5)
20. (a) What is inelastic collision pumping?
- (b) Describe the construction and working of He-Ne laser with necessary energy level diagram. (2.5 + 10)

\*\*\*\*\*