



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

**FIFTH SEMESTER – APRIL 2017**

**PH 5511- OPTICS**

Date: 26-04-2017  
01:00-04:00

Dept. No.

Max. : 100 Marks

**PART-A**

Answer ALL Questions

**(10x2=20 marks)**

1. What are nodal points and nodal planes of a lens system?
2. What is meant by coma?
3. A thin sheet of a transparent material ( $\mu=1.60$ ) is placed in the path of one of the interfering beams in a biprism experiment using sodium light,  $\lambda=5890 \text{ \AA}$ . The central fringe shifts to a position originally occupied by the 12<sup>th</sup> fringe. Calculate the thickness of the sheet.
4. What is an etalon?
5. What is the radius of the first half period zone in a zone plate behaving like a convex lens of focal length 60cm for light of wavelength 6000  $\text{\AA}$ ?
6. Define resolving power of a telescope.
7. State Malus law.
8. Define specific rotation.
9. What is induced emission?
10. What is an optical fibre? What is its working principle?

**PART-B**

Answer ANY FOUR Questions

**(4X7.5=30 marks)**

11. With a neat diagram explain the construction and working of Ramsden's eye piece. Discuss its merits and demerits.
12. Explain about the matrix method in the study of the effect of refraction on the coordinates of the ray.
13. What is an air wedge? Explain the formation of interference fringes by an air-wedge. Derive an expression for the fringe width.
14. Explain Fraunhofer diffraction at a circular aperture.
15. i) Explain the construction and working of quarter wave plate. **(5.5 marks)**  
ii) Calculate the thickness of a quarter wave plate for light of wavelength  $5.9 \times 10^{-7} \text{ m}$ . Principal refractive indices are  $\mu_o=1.544$  and  $\mu_e=1.553$ . **(2 marks)**
16. What is Kerr effect? Explain the construction and working of a Kerr cell.

**PART-C**

Answer ANY FOUR Questions :

**( 4x12.5 = 50marks )**

- 17.i) What is direct vision prism? Derive an expression for the net dispersion produced by an achromatic prism. **(7 marks)**
- ii) Explain the principle, construction and working of direct vision spectroscopy. **(5.5 marks)**
18. Explain the principle, construction and working of Michelson's interferometer with a neat diagram. How is it used to determine the difference in wavelengths between two closely spaced spectral lines?
19. i) What is plane transmission grating? Explain its theory. **(8 marks)**
- ii) A parallel beam of light of wavelength  $5460 \text{ \AA}$  is incident at an angle of  $30^\circ$  on a plane transmission grating which has 6000 lines/cm. Find the highest order spectrum that can be observed. **(4.5 marks)**
20. Discuss the theory of Fresnel diffraction at a straight edge. **(7.5 marks)**
- Find the intensity i) at the edge of the geometrical shadow **(2.5 marks)**
- ii) within the geometrical shadow. **(2.5 marks)**
21. Explain the production and detection of circularly and elliptically polarized light.
22. What is Nd : YAG laser? Explain its construction and working with necessary diagram.

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