

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – APRIL 2016

PH 5511 – OPTICS

Date: 29-04-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART - A

Answer ALL questions:

(10 x 2 = 20 marks)

1. Define (a) Coma and (b) Spherical aberration.
2. What are cardinal points and unit points in an optical system.
3. State the conditions necessary for observing interference fringes?
4. What are antireflection coatings?
5. State the differences between Fresnel and Fraunhofer types of diffraction.
6. Deduce the missing orders for a double slit Fraunhofer diffraction pattern, if the slit widths are 0.16 mm and they are 0.8 mm apart.
7. Calculate the least thickness of a quartz plate, given $\mu_o = 1.658$, $\mu_e = 1.486$ and the wavelength of light is 5890 \AA .
8. State Malu's law.
9. State the important characteristics of a laser beam.
10. What is an optical fibre?

PART – B

Answer any FOUR Questions:

(4 x 7.5 = 30 marks)

11. Discuss the longitudinal chromatic aberrations in the image formed by a single lens with respect to certain position of an object.
12. Describe Fresnel's biprism. Explain how the wavelength of light can be determined with its help.
13. Discuss the phenomenon of diffraction at a straight edge, to obtain the position of maximum and minimum intensity from the centre.
14. Explain the concept of optical activity and specific rotation. A 200 mm long tube containing 48 cm^3 of sugar solution produces an optical rotation of 11° . If its specific rotation is 66° , calculate the quantity of sugar contained in the tube in the form of solution.
15. Outline the theory of plane transmission grating.
16. Explain the different harmonic generation achieved with respect to wave propagation through a non-linear optical medium.

PART – C

Answer any FOUR Questions:

(4 x 12.5 = 50 marks)

17. Obtain the system matrix for thick lens and derive the lens formula for thin lens. Find the system matrix for a thin lens placed in air having a refractive index of 1.5 and radii of curvature 50 cm each. (10+2.5)
18. Give the construction and working of Michelson Interferometer with neat diagram. Explain the procedure for finding the thickness of a thin transparent sheet using Michelson Interferometer. (9+3.5)
19. Discuss Fraunhofer diffraction due to a single slit. The diffraction pattern of a single slit of width 0.5 cm is formed by a lens of focal length 40 cm. Calculate the distance between the first dark and the next bright fringe from the axis. Wave length of light used is 4890 \AA . (10+2.5)
20. Explain the production and deduction of elliptically polarised light and circularly polarised light. (6+6.5)
21. What is population inversion? Explain the construction and working of Nd-YAG laser. (2.5+10)
22. Explain the propagation of light through an optical fibre and derive an expression for the acceptance angle.
