



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2011

PH 5509/PH 5506/PH 3500 - OPTICS

Date : 04-11-2011
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

PART – A

Answer **ALL** the questions.

10x2 = 20 Marks

1. What are nodal points and nodal planes?
2. What is meant by chromatic aberration in lenses?
3. Compare the fringes produced by biprism with those produced by Lloyd's mirror.
4. In a Michelson interferometer 150 fringes cross the field of view when the movable mirror is moved through 0.0442mm. Find the wavelength of the light used.
5. What is a zone plate? How does it differ from a convex lens?
6. Define dispersive power of a grating.
7. State the law of Malus.
8. What is a quarter wave plate?
9. Distinguish between spontaneous and stimulated emissions.
10. What do you understand by second harmonic generation?

PART – B

Answer any **FOUR** questions.

4x7.5 = 30 Marks

11. (a) Define dispersive power of a prism. (2)
(b) Derive the condition for the combination of two thin prisms to produce mean deviation without net dispersion. Also obtain an expression for the net mean deviation. (3+2.5)
12. (a) What do you mean by achromatic fringes? (2)
(b) How would you obtain achromatic fringes using Lloyd's mirror. (5.5)
13. (a) What do you understand by resolving power of an optical instrument? (2)
(b) Derive an expression for the resolving power of a plane transmission grating. (5.5)
14. (a) Explain the action of a half wave plate when a plane polarized light is incident normally on it. (5)
(b) Calculate the thickness of a half wave plate for light of wavelength 6000\AA .
Given $\mu_e = 1.553$ and $\mu_o = 1.533$. (2.5).

15. Describe an optical resonant cavity and explain how it is used to achieve amplification of light. (4+3.5)

PART-C

Answer any **FOUR** questions.

4×12.5 = 50 Marks

16. Explain the construction and working of Huygens eyepiece with the help of a neat diagram and indicate the positions of its cardinal points. (3.5+5+4)
17. (a) Describe a Michelson interferometer. (4)
(b) How would you use it to determine the wavelength of a monochromatic light and refractive index of a thin transparent sheet? (4.5+4)
18. (a) Discuss Fraunhofer diffraction pattern of a straight edge. (8.5)
(b) How does this pattern differ from that due to a straight wire? (4)
19. (a) Define specific rotation. (2.5)
(b) Explain a method to determine the specific rotation of a sugar solution. (8)
(c) A 20cm long glass tube containing sugar solution rotates the plane of polarisation by 12° . If the specific rotation of sugar is 66° , find the concentration of the solution. (2)
20. (a) Mention the important characteristics of a laser beam. (2)
(b) Describe a He-Ne laser and explain its working with energy level diagram. (3.5+7)
