



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc., DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2013

PH 5509/PH 5506/PH 3500 – OPTICS

Date : 09/11/2013
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

SECTION - A

Answer **ALL** questions:

(10 × 2 = 20 marks)

1. What are nodal points and nodal planes?
2. State the condition for achromatism of a combination of two thin lenses in contact.
3. Distinguish between the fringes produced by biprism and Lloyd's mirror.
4. What is meant by antireflection coating?
5. Calculate the possible order of spectra with a plane transmission grating having 6×10^5 lines per metre when light of wavelength 5500 \AA is used.
6. Define resolving power of a plane diffraction grating.
7. State the law of Malus.
8. Define specific rotation.
9. What do you mean by metastable state?
10. What is the main advantage of stimulated Raman scattering?

SECTION – B

Answer any **FOUR** questions:

(4 × 7.5 = 30 marks)

11. (a) Explain chromatic aberration in lenses. (2 1/2)
(b) Derive the condition for the achromatism of two thin lenses separated by a distance. (5)
12. How would you determine the wavelength of light using Lloyd's mirror experiment?
13. Discuss Fraunhofer diffraction at a circular aperture.
14. (a) What is elliptically polarized light? (2 1/2)
(b) How is it produced? (5)
15. (a) Distinguish between spontaneous and stimulated emissions. (5)
(b) Write a note on optical pumping. (2 1/2)

SECTION – C

Answer any **FOUR** questions:

(4 × 12.5 = 50 marks)

16. (a) Give the construction and working of Huygen's eye-piece, with the help of a neat diagram. (4 .5 + 5)
(b) Find the positions of principal points and focal points. (1 .5 + 1 1/2)

17. (a) Describe a Michelson interferometer. (4 1/2)
(b) How can it be used for measuring the wavelength of light? (8)
18. (a) Give the theory of a zone plate. (6)
(b) Compare it with a convex lens. (4)
(c) What is the radius of the first half period zone in a zone plate behaving like a convex lens of focal length 40cm for light of wavelength 6000 \AA ? (2 1/2)
19. (a) Describe the construction of a Nicol prism and show how it can be used as a polarizer and analyzer. (2 1/2 + 3 +3)
(b) Distinguish between a quarter wave plate and a half wave plate. (4)
20. (a) Explain in brief the characteristics of a laser beam. (4)
(b) Describe the construction and working of He-Ne laser. (8 1/2)

\$\$\$\$\$\$