LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – NOVEMBER 2012

# PH 5509/5506/3500 - OPTICS

 Date : 06/11/2012 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**PART - A**

**Answer ALL questions: (10 × 2 = 20 marks)**

1. What are unit planes of a lens system?
2. Two lenses of focal lengths 7cm and 3cm are placed at a certain distances apart. Calculate the distance between the lenses for the achromatic combination.
3. What is antireflection coating?
4. Mention the applications of Michelson’s interferometer.
5. Distinguish between Fresnel and Fraunhofer types of diffraction.
6. What is Rayleigh’s condition for resolution?
7. State and explain Brewster’s law.
8. What is a half wave plate? Mention its action on a plane polarized light incident on it.
9. What are the essential components of a laser?
10. What is meant by second harmonic generation?

**PART – B**

**Answer any FOUR questions. (4 × 7.5 = 30 marks)**

11. (a) What is spherical aberration? (2)

 (b) Obtain the condition for minimizing spherical aberration in the case of two coaxial lenses

 separated by a distance. (5.5)

12. (a) What are coherent sources? (2)

 (b) How would you determine the wavelength of light using Lloyd’s mirror experiment? (5.5)

13. (a) What is a zone plate? (2.5)

 (b) Compare it with a convex lens. (5)

14. Explain the production of elliptically and circularly polarized light. (3.5+4)

15. Write a note on stimulated Raman scattering.

**PART – C**

**Answer any FOUR questions: (4× 12.5 = 50 marks)**

16. (a) Derive the conditions for the combination of two narrow angled prisms to produce

 (i) dispersion without deviation and (ii) deviation without dispersion. (5+5) (b) A telescope objective of focal length 1.5m is an achromat made of two lenses whose

 materials have dispersive powers 0.018 and 0.027. Calculate the focal lengths of the two

 lenses. (2.5)

17. (a) Describe the construction and working of Fabry-Perrot interferometer. (3.5+5)

 (b) Explain how it can be used to determine the wavelength of light. (4)

18. (a) Give the theory of a diffraction grating. (7.5)

 (b) Describe, in detail, how you would use a transmission grating for measuring the

 wavelength of light. (5)

19. (a) Define specific rotation. (2)

 (b) Explain how it is experimentally determined using Laurent’s half shade polarimeter.

 (8.5)

 (c) Determine the specific rotation of the given sample of sugar solution if the plane of

 polarization is turned through 12º and the length the tube containing 10% sugar solution

 is 25cm. (2)

20. (a) What is population inversion? (2)

 (b) Describe the construction and working of CO2 laser with neat diagrams. (3.5+7)

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