LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2016**

PH 5509/PH 5506/PH 3500 – OPTICS

Date: 29-04-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART-A

Answer All Questions **(10x2=20 marks)**

1. What are nodal planes of a lens system?
2. Define angular dispersion and dispersive power.
3. In Lloyd's single mirror interference experiment, the slit source is at a distance of 2 mm from the plane of the mirror. The screen is kept at a distance of 1.5 m from the source. Calculate the fringe width. (Given: Wave length of light is 5890 $\mathring{A}$).
4. What is an etalon?
5. What is a zone plate? Give the expression for the radius of the n^{th} half period zone.
6. Distinguish the spectra of prism from that of grating.
7. State Brewster's law.
8. Expalin is optical activity? Give any two examples for optically active substance.
9. What is a Meta stable state?
10. Briefly explain stimulated Raman scattering.

PART-B

Answer ANY FOUR Questions **(4x7.5=30 marks)**

11. What is a system matrix? Obtain it for two thin lenses separated by a distance and hence derive the formula for focal length and also find the positions of principal planes.

12. i) How do you construct a direct vision prism? (2 marks)
    ii) A crown glass prism of refracting angle 8° is combined with a flint glass prism to obtain deviation without dispersion. If the refractive indices for red and violet rays for crown glass are 1.514 and 1.524 and for the flint glass are 1.645 and 1.665 respectively, find the angle of flint glass prism and net deviation. (5.5 marks)

13. What is an air wedge? Explain the formation of interference fringes by an air-wedge. Derive an expression for the fringe width. How can the above method be used to measure the diameter of a thin wire accurately?

14. Derive an expression for the resolving power of a microscope.

15. Explain the phenomenon of double refraction with a neat diagram. Discuss the Huygen's theory of double refraction in uniaxial crystals.

16. Outline the theory of second harmonic generation.

PART–C

Answer ANY FOUR Questions **(4x12.5 = 50marks)**

17. What do you mean by spherical and chromatic aberration of a lens? Explain their causes. How would you correct for chromatic in the case of a lens system in contact and out of contact.

18. Describe Fresnel's biprism. Using this how the wavelength of light determined.

19. In detail describe the Michelson's interferometer with a neat diagram. How will you produce circular fringes with it?

20. Discuss the theory of Fresnel diffraction at circular aperture and find the i) intensity at an axial point ii) intensity at a non-axial point. Give its importance.

21. i) Explain the principle, construction and working of Nicol prism. Discuss how it can be used as an analyser. (7.5 marks)
    ii) What is a half wave plate? (2 marks)
    iii) A 200 mm long tube containing 48 cm^3 of sugar solution produces an optical rotation of 11° when placed in a saccharimeter. If the specific rotation of sugar solution is 66°. Calculate the quantity of sugar contained in the tube in the form of a solution. (3 marks)

22. With a neat diagram, explain in detail, the construction and working of Helium-Neon Laser.

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