



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2014

PH 5511/5509/5506/3500 - OPTICS

Date : 01/11/2014
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

PART-A

Answer ALL Questions:

(10x2=20 marks)

1. What are cardinal points?
2. State any two differences between Ramsden's and Huygen's eyepiece.
3. What are the techniques used for creating the coherent sources of light?
4. In Lloyd's single mirror interference experiment, the slit source is at a distance of 2mm from the plane of the mirror. The screen is kept at a distance of 1.5m from the source. Calculate the fringe width. (Given: Wave length of light is 5890 \AA).
5. What is a zone plate?
6. State Rayleigh's criterion for resolution.
7. State Brewster's law.
8. Calculate the thickness of a doubly refracting plate capable of producing a path difference of $\lambda/4$ between ordinary and extraordinary waves. Given: $\lambda=5890 \text{ \AA}$, $\mu_o=1.53$, $\mu_e=1.54$.
9. What is meant by population inversion?
10. What is Kerr effect?

PART-B

Answer any FOUR Questions:

(4x7.5=30 marks)

11. i) Show that $d\mu/d\lambda$ is inversely proportional to λ^3 . (1.5marks)
ii) Calculate the values of Cauchy's constants A and B for crown glass (Given: $\mu_c=1.514$, $\mu_f=1.524$, $\lambda_c=6563 \text{ \AA}$, $\lambda_f=4862 \text{ \AA}$). (6 marks)
12. Derive the conditions for minimum spherical aberration for a combination of two thin lenses.
13. Explain the phenomenon of interference in thin films due to reflected light.
14. What is plane transmission grating? Explain its theory.
15. What is double refraction? Explain the Huygen's theory of double refraction in an uniaxial crystal. .
16. Discuss the principle, configuration of optical fibres and also explain how the wave is propagated in single mode and multimode fibres.

PART-C

Answer any FOUR Questions:

(4x12.5 = 50 marks)

17. What is system matrix? Analyze the system of thin lenses using the Matrix formulation and hence derive the formula for its focal length.
18. Describe Fresnel's Biprism. Explain how the wavelength of light can be determined with its help.
19. Describe in detail about Michelson's interferometer with a neat diagram. How will you produce circular fringes with it?.
20. i) Explain the phenomenon of Fraunhofer diffraction at a double slit. (9.5 marks)
ii) Two pin holes 1.5 mm apart are placed in front of a source of light of wave length 5.5×10^{-5} cm and seen through a telescope with its objective stopped down to a diameter of 0.4 cm. Find the maximum distance from the telescope at which the pinholes can be resolved. (3 marks)
21. i) Define the specific rotation of a solution. (2 marks)
ii) Describe the construction and working of Laurent's half-shade Polarimeter and explain how it is used to determine the specific rotation of sugar solution. (10.5 marks)
22. Explain the principle, construction and working of a Nd:YAG Laser.

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