LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **NOVEMBER 2016**

PH 5511 – OPTICS

Date: 05-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A **(10 x 2 = 20 Marks)**

Answer ALL the questions:

1. Define unit planes of a lens system.
2. Write the condition for no curvature defect for two lenses placed in air.
3. What is Fresnel's biprism?
4. Give the principle of Michelson's interferometer.
5. Find the radius of second transparent zone of a zone plate whose first focal length is 1m for $\lambda = 5893$ Å.
6. Define dispersive power of a grating.
7. State Brewster's law.
8. Calculate the thickness of double refracting plate capable of producing a path difference of $\frac{\lambda}{4}$ between extraordinary and ordinary rays. Given $\lambda = 5000$ Å, $\mu_e = 1.5533$ and $\mu_o = 1.5442$.
9. What is meant by second harmonic generation?
10. What is Kerr effect?

PART – B **(4 x 7.5 = 30 Marks)**

Answer any FOUR questions:

11. (a) Explain the construction and working of direct vision spectroscope. (5)

    (b) For crown and flint glass, for C and F lines $\mu_C = 1.515$ and $\mu_F = 1.523$ and $\mu_C = 1.644$ and $\mu_F = 1.664$ respectively. Calculate the angle of flint glass prism which may be combined with crown glass prism having refracting angle 20° so that the combination is achromatic for C and F rays. (2.5)
12. Enlist the conditions for a thin film to act as an antireflective coating.
13. Obtain the expression for resolving power of a prism.
14. Discuss the production and detection of circularly polarized light.
15. Derive the expression for acceptance angle of an optical fibre.
16. Describe the working of Nd:YAG laser using energy level diagram.

PART – C **(4 x 12.5 = 50 Marks)**

Answer any FOUR questions:

17. (i) Derive lens maker's formula for thin lens. (6)

    (ii) Explain how spherical and chromatic aberrations are minimised in a Huygen's eyepiece. (6.5)

18. Describe Lloyd's single mirror experiment and explain how achromatic fringes are obtained with its help. (6+6.5)

19. (i) Discuss Fraunhoffer diffraction due to a double slit. (9.5)

    (ii) A parallel beam of monochromatic light is allowed to be incident normally on a plane transmission grating having 6000 lines / cm and the second order spectral line is diffracted through 30°. Calculate the wave length of the spectral line. (3)

20. Describe the construction and working of Laurent's half shade polarimeter. Explain how it is used to determine the specific rotation of an optically active solution. (9.5+3)

21. Explain spontaneous emission and stimulated emission. Derive Einstein coefficients. (5+7.5)

22. Describe Fresnel's diffraction at a circular aperture and find the expressions for n^{th} bright ring and n^{th} dark ring. (6+6.5)

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