LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION –**PHYSICS**

FIFTH SEMESTER – **APRIL 2018**

PH 5509 / PH 5506– OPTICS

Date: 04-05-2018   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

PART-A

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

1. A hollow 60° prism is filled with carbon disulfide whose index of refraction for blue light is 1.652, and for red light 1.618. What is the angular dispersion?

2. Compare Ramsden's and Huygens's eyepieces.

3. Distinguish between the fringes produced by biprism and Lloyd's mirror.

4. Mention any two uses of Michelson's interferometer.

5. What is a zone plate? Give the expression for the radius of the nth half period zone.

6. Define the term resolving power of microscope.

7. State Malus law.

8. Calculate the thickness of a half-wave plate for light of wavelength 580 nm. Principal refractive indices are $n_0=1.544$ and $n_e= 1.553$.

9. What is an active medium?

10. What is meant by stimulated Raman scattering?

PART-B

Answer ANY FOUR Questions   **(4X7.5=30 marks)**

11. What is meant by achromatism? Derive the condition for achromatism of two thin lenses placed in contact.

12. What is an air wedge? Explain the formation of interference fringes by an air-wedge. Derive an expression for the fringe width.

13. Explain the theory of plane transmission grati*ng*.

14.What is meant by double refraction? Explain the construction,working and uses ofa Nicol prism.

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15. Explain how the second harmonic generation is achieved.

16. Determine Einstein's coefficients for spontaneous and stimulated emission.

PART–C

Answer ANYFOUR Questions :   (**4x12.5 = 50marks**)

17.   i)What is system matrix?   **(1.5)**

   ii) Calculate the values of Cauchy's constants A and B for crown glass

 (Given: μ_C=1.514, μ_F=1.524, λ_C=656.3 nm, λ_F=486.2 nm).   **(5)**

 iii) Derive the conditions for the combination of two narrow angled prisms to produce dispersion

 without deviation.   **(6)**

18.   Describe Fresnel's Biprism. Explain how the wavelength of light is determined using it.

19.   Explain the phenomenon of Fresnel's diffraction at a straight edge and discuss

 the intensity i) at the edge of the geometrical shadow ii) within the geometrical shadow .

20. i) Define the specific rotation of a solution.   **(2)**

   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)**

21. i) Write three differences between ruby and He-Ne laser**.(3)**

   ii) With the necessary diagram describe the construction and working of solid state ruby laser.

(9.5)

 22. What are quarter and half wave plates? Explain the use of these plates in the production and

determination of elliptically and circularly polarized light.

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