LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2023**

UPH 5503 – OPTICS

Date: 12-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART –A

Answer ALL questions: **(10 x 2 = 20 Marks)**

1. What are the common defects in the images produced by a single lens?
2. Write a short note on Ramsden's eyepiece.
3. What are antireflection coatings?
4. Write the condition for obtaining bright fringes using Fresnel's biprism.
5. Define Fraunhofer diffraction.
6. What is dispersive power?
7. What is meant by polarization of light?
8. Define Malu's law.
9. What is population inversion?
10. State the principle of optical fibres.

PART –B

Answer any FOUR questions: **(4 x 7.5 = 30 Marks)**

11. Derive the lens formula for thin lenses.
12. Obtain an expression for fringe width in a wedge shaped thin film. How is it used for testing the optical quality of a flat surface?
13. State Rayleigh criterion of resolution. Derive an expression for the resolving power of a telescope.
14. Explain Huygens' theory of double refraction in a uniaxial crystal.
15. Write a note on spontaneous and stimulated emission of radiation. Explain the functioning of Nd-YAG laser.
16. a) Discuss the medical applications of laser.

    b) A microscope is used to resolve two self-luminous objects separated by a distance of 4.0×10^{-5} cm. If the wavelength of light is 5461 Å, calculate the numerical aperture of the objective. (4+3.5)

PART – C

Answer any FOUR questions: **(4 x 12.5 = 50 Marks)**

17. Explain how two narrow angled prisms of different dispersive powers may be combined to produce dispersion without deviation and deviation without dispersion.
18. Describe Michelson interferometer and show how it can be used for measuring the wavelength of any line in a spectrum.
19. Starting from the division of a plane wave-front into half-period elements, give Fresnel's explanation of rectilinear propagation of light.
20. Discuss the production and detection of circularly polarized light.
21. Explain with the help of an appropriate diagram, how stimulated emission occurs in He-Ne gas laser.
22. a) Explain spherical aberration in lens. How is it caused and what are the ways to minimize it?

    b) A sugar solution in a tube of length 20 cm produces optical rotation of 13°. The solution is then diluted to one-third of its previous concentration. Find the optical rotation produced by a 30 cm long tube containing the diluted solution.

(7.5+5)

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