BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025

2018, 2019, 2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY

SEMESTER IV - COMPLEMENTARY COURSE 2 (PHYSICS)

PH4C01B18 - Physical Optics, Laser Physics and Dielectrics

Time : 3 Hours   Maximum Marks : 60

Part A

I. Answer any Ten questions. Each question carries 1 mark   (10x1=10)

1. Write the conditions of bright and dark Newton's rings in reflected and transmitted systems.

2. Is law of energy conservation satisfied in the phenomenon of interference? Briefly explain.

3. Whether sound waves interfere or not? Give conditions for interference.

4. Cite the assumptions made by Fresnel in explaining diffraction.

5. Distinguish between various types of diffraction.

6. Distinguish between elliptically and circularly polarised light.

7. What do you mean by dichroism?

8. List down the features of optical pumping.

9. Distinguish between the nature of light emitted due to spontaneous and stimulated emission.

10. Define absolute permittivity of a medium.

11. Define dielectric constant of a material.

12. What do you mean by Holography?

Part B

II. Answer any Six questions. Each question carries 5 marks   (6x5=30)

13. In Newton's rings experiment, the diameter of nth dark ring is 0.293 cm. When a liquid is introduced between the glass plate and lens, it changes to 0.254 cm. Find the refractive index of the liquid.

14. Explain various applications of optical fibres.

15. In a plane diffraction grating the number of lines per cm is 5500. Find the angular separation between the wavelengths 546nm and 548nm in the second order.

16. A plane polarized light is incident perpendicularly on a quartz plate cut with its faces parallel to optic axis. Find the thickness of the quartz plate which introduces a phase difference of 60 degree between e-ray and o-ray.

17. Plane polarized light passes through a doubly refracting plate with its optic axis parallel to the faces. Calculate the least thickness of the plate for which the emergent beam will be plane polarised. Given $\lambda = 5000 \mathring{A}$, $\mu_e = 1.55$ and $\mu_o = 1.54$

18. Establish the condition for light amplification.

19. Explain the interaction of light and matter and hence obtain the expression for intensity of light at a distance x in the medium.

20. The dielectric constant of water is 78. What is its electrical permittivity?

21. Write a note on Ionic polarizability.

Part C

III. Answer any Two questions. Each question carries 10 marks   (2x10=20)

22. With necessary theory explain the experiment to determination of wave length of light using Newton's rings arrangement.

23. Obtain an expression relating the electric field intensity, polarization vector and dielectric displacement vector of dielectric materials. Derive an expression connecting susceptibility and dielectric constant.

24. Discuss the methods of producing polarized light using double refraction and scattering.

25. Discuss the working of a Ruby Laser with the help of suitable diagrams .