TB244654R

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2022 ADMISSIONS REGULAR

SEMESTER IV - Mathematics 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. Give the relation between optical path length and geometrical path length of a light wave.
2. Write the expressions for maximum and minimum intensity, when two coherent waves of same amplitude interfere.
3. Comment on the colour of a parallel thin film when it is irradiated with white light.
4. Sketch the intensity pattern due to interference and diffraction.
5. Distinguish between various types of diffraction.
6. Distinguish between elliptically and circularly polarised light.
7. List any two differences between polarised and unpolarised light.
8. State the Planck's quantum hypothesis.
9. Express the relative population under thermal equilibrium. Explain.
10. Explain the formation of induced dipoles.
11. Distinguish between polar and nonpolar molecules.
12. Distinguish between Holography and Photography.

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. What do you meant by acceptance angle of an optical fibre? Deduce its expression.
15. A parallel beam of monochromatic light is allowed to be incident on a plane grating 0.5cm wide with 625 lines , a second order spectral line is observed to be deviated through 30 degrees. Calculate the wavelength of the spectral line.
16. Calculate the thickness of a doubly refracting plate capable of producing a path difference of $\frac{\lambda}{4}$ between ordinary and extraordinary rays. Given $\lambda = 5890\text{Å}$.
17. Plane- polarized light is incident on a single polarizing disk with the direction of E_0 parallel to the direction of the transmission axis. Through what angle should the disk be rotated so that the intensity in the transmitted beam is reduced by a factor of 3.
18. Discuss and compare various pumping schemes.
19. The wavelength of emission is $6000A^0$ and the lifetime τ_{sp} is 10^{-6}s. Determine the coefficient for the stimulated emission.
20. Discuss the process of electronic polarization in materials.
21. Write a note on electric polarization vector of dielectric materials.

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. Explain the theory of plane diffraction grating and hence explain the experiment to determine the wavelength of light.
24. Discuss the production of linearly, circularly and elliptically polarized light using Huygen's theory of double refraction.
25. Discuss the working of a Ruby Laser with the help of suitable diagrams .