TB245172J

Reg. No :.....

Name :.....

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

2018, 2019, 2020, 2021 ADMISSIONS SUPPLEMENTARY

SEMESTER V - CORE COURSE (PHYSICS)

PH5B07B18 - Physical Optics and Photonics

Time : 3 Hours **Maximum Marks : 60**

Part A

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

1. Explain the superposition principle.
2. Determine the phase difference between two coherent waves having wavelength 540nm when the path difference between them is 36nm.
3. Enlist the salient features of fringes when a wedge-shaped film is illuminated by white light.
4. Distinguish between Fresnels and Fraunhofer diffractions.
5. Distinguish between the single slit and double-slit diffraction patterns.
6. State and explain Brewster's law.
7. Describe the applications of Brewster's law.
8. Distinguish between active centers and active medium in a laser system.
9. Mention four the features of laser light.
10. Give an example for laser used for cutting and drilling.
11. Write down an equation for mode volume in terms of V parameter of optical fiber.
12. Discuss four advantages of optical fibre communication.

Part B

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

13. Explain analytically how the intensity is distributed when two coherent sources superpose.
14. Light containing two wavelengths λ_1 and λ_2 falls normally on a plano-convex lens of radius of curvature R resting on a glass plate. If the n^{th} dark ring due to λ_1 coincides with the $(n+1)^{th}$ of λ_2, determine the radius of the n^{th} ring in terms of λ_1 ,λ_2 and R.
15. Explain the rectilinear propagation of light using the concept of half-period zones.
16. Find the half angular width of the central bright maximum in Fraunhoffer diffraction pattern of a single slit of width 0.0012mm when the slit is illuminated by monochromatic light of wavelength 600nm.
17. Explain the production of linearly polarised light by the method of reflection.
18. If the plane of vibration of the incident beam makes an angle of 60 degrees with the optic axis. Compare the intensities of ordinary and extraordinary rays.
19. The wavelength of emission in a laser is 600 nm and the life time of the upper level is 1 microsecond. Determine the coefficient for stimulated emission.
20. Compare the V parameters of a step-index fiber with core index 1.45 and relative index difference of 0.01 and a graded-index fiber with the same parameters. The transmission wavelength is 1 micron and both fibers have a core diameter of 10 microns.
21. The numerical aperture of an optical fiber is 0.45 and the core index is 1.58. Find the refractive index of the cladding

Part C

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

22. Explain the Young's double slit experiment and deduce an expression for its fringe width. Comment on the factors upon which the fringe width depends.
23. Describe the method to determine the wavelength of monochromatic light using transmission grating.
24. Explain Optical activity using Fresnel's theory.
25. Describe the role of helium in He-Ne laser. Using the energy level diagram, argue that this is a four level laser system. How does it produce red emission?