TB245509F

Reg. No :.....

Name :.....

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

2022 ADMISSIONS REGULAR

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. What do you mean by coherent sources of light?
2. The central part of Newton's ring is dark in the reflected system, explain the mathematical reason.
3. Newton's ring is circular in shape. Justify the point.
4. Describe any two diffraction phenomena in nature.
5. Define dispersive power of grating.
6. Distinguish between ordinary and extraordinary rays.
7. Write a note on specific rotation.
8. Define spontaneous emission.
9. Give two examples for lasers used for medical application.
10. Mention four the features of laser light.
11. Define V parameter. Why is it called normalised frequency?
12. What is mode volume in optical fiber?

Part B

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

13. Discuss the theory of Michelson interferometer.
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. Determine the position for maxima and minima in Fresnel diffraction patterns due to straight edge.
16. In a Fraunhoffer diffraction due to a narrow slit, a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.2mm and the first minima lie 5mm on either side of the central maximum, find the wavelength of light.
17. Explain the experimental method to determine principal refractive indices.
18. Calculate the minimum thickness of a quarter-wave plate for a light of wavelength 600nm. Given refractive indices for ordinary and extraordinary rays are 1.533 and 1.544 respectively.
19. A laser tube is 10 cm long and the active material has a gain coefficient of 0.0098/cm. Neglecting the loss factor, calculate the reflectivity of the output mirror assuming that the other mirror is 100% reflecting.
20. Optical power of 1mW is launched into an optical fiber of length 1 km. If the power emerging from the other end is 15% that of the input, calculate the fiber attenuation.
21. An optical fiber is 3 meter long with a diameter of 30 micrometer. If a ray of light is incident at one end of the fiber at an angle of 35 degree, how many reflections will it take before emerging from the other end? Assume that the cladding is air and the fiber refractive index is 1.45.

Part C

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

22. With the necessary theory, describe an experiment to determine the refractive index of liquid using Newton's ring apparatus.
23. With the necessary theory, Explain the diffraction pattern of a double slit.
24. Discuss the superposition of waves linearly polarized at right angles.
25. Describe the attenuation and dispersion mechanisms in optical fiber.