K24U 3443

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E.-Regular/Supplementary/ Improvement) Examination, November 2024
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN PHYSICS FOR B.Sc. PROGRAMMES
3C03PHY : Optics and Photonics

Time : 3 Hours Max. Marks : 32

PART – A

Short answer questions. Answer **all** questions. **Each** carries **one** mark. **(5×1=5)**

1. Superposition of in coherent waves produces uniform illumination. Justify.
2. Show that areas of Fresnel half-period zones are equal.
3. A polarizer reduced the intensity of the original unpolarized light by half. Explain.
4. What do you mean by population inversion ? How can one achieve it ?
5. Sketch the index profile of a step index and a graded index fibre.

PART – B

Short essay questions. Answer **any four** questions. **Each** carries **two** marks. **(4×2=8)**

6. How can you determine the refractive index of a transparent liquid using Newton's ring arrangement ?
7. Define dispersive power of a grating. Obtain an expression for it.
8. Show that the reflected and refracted rays are perpendicular to each other when rays are incident at the Brewster angle.
9. Mention the differences between o-rays and e-rays.
10. How is a hologram quite different from an ordinary photograph ?
11. Explain the working of any one fibre optic sensor.

P.T.O.

PART – C

Problems. Answer **any three** questions. **Each** carries **three** marks. **(3×3=9)**

12. The sources of intensities I_1 and I_2 are superimposed so that the ratio of the maximum to minimum intensity is found to be 25. Find I_1/I_2.
13. A beam of monochromatic light of wavelength 582 nm falls normally on a glass wedge with the wedge angle of 20 seconds of an arc. If the refractive index of glass is 1.5, find the number of dark fringes per cm of the wedge length.
14. Find the radii of the first and 100^{th} zone of a zone plate of focal length 18 cm for a light of wavelength 6000 Å.
15. Calculate the thickness of a mica sheet required for making a quarter wave plate if λ = 5460 Å, μ_e = 1.592, μ_o = 1.586.
16. Determine the numerical aperture of a step-index fibre with core of refractive index 1.5 and cladding of refractive index 1.48. Also, calculate the angle of acceptance when fibre is in air.

PART – D

Long essay. Answer **any two** questions. **Each** carries **five** marks. **(2×5=10)**

17. Discuss the interference by a plane parallel film obliquely illuminated by a plane wave.
18. Discuss Fraunhofer diffraction pattern due to a single slit. Also, explain the intensity distribution curve.
19. How can you distinguish between a (a) linearly polarized, (b) circularly polarized, and an (c) elliptically polarized light ?
20. Explain the working of a Helium-Neon gas laser.

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