

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022**(Regular/Improvement/Supplementary)****PHYSICS****GPHY5B08T: OPTICS****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries *two* marks.****(Ceiling 20 Marks)**

1. State Fermat's principle of optimum path and deduce laws of refraction.
2. State principle of superposition
3. What are the conditions for obtaining sustained interference pattern on a screen.
4. A very thin film does not show colour, why?
5. Compare zone plate and convex lens
6. Define resolving power and dispersive power of a plane diffraction grating
7. What is meant by optical activity?
8. How is a hologram different from a photograph?
9. What are the applications of a hologram?
10. Draw the refractive index profile and ray diagram of graded index fibre.
11. Define numerical aperture of an optical fibre.
12. Write note on fibre optic sensors.

SECTION B: Answer the following questions. Each carries *five* marks.**(Ceiling 30 Marks)**

13. A thin biconvex lens of refractive index 1.5 has radius of curvatures $R_1 = +100$ cm and $R_2 = -60$ cm. For an object placed at a distance of 100 cm from the lens, determine the position and linear magnification of the image.
14. A biprism is placed 5 cm from a slit illuminated by sodium light of wavelength 589 nm. The width of the fringes obtained on a screen 75cm from the biprism is 9.424×10^{-2} cm. What is the distance between the two coherent sources?
15. If a zone plate has a principal focal length of 50cm corresponding to $\lambda = 6 \times 10^{-5}$ cm, obtain the radii of different zones. What is the principal focal length for $\lambda = 5 \times 10^{-5}$ cm?

(PTO)

16. A plane polarised light of wavelength 500 nm, passes through a uniaxial crystal with its optic axis parallel to the faces. Determine the least thickness of the plate for which emergent ray is plane polarised. Given refractive index of O-ray is 1.5442 and E-ray is 1.5533.
17. A step index fibre has a core of refractive index 1.54 and numerical aperture 0.45. Find the refractive index of cladding and also calculate the value of angle of acceptance cone.
18. Explain how specific rotation of a liquid is determined using Laurentz Half shade polarimeter.
19. With the help of a neat diagram explain the process of construction and reconstruction of a hologram.

SECTION C: Answer any one question. Each carries ten marks.

20. Explain interference by a plane parallel thin film illuminated by a plane wave and obtain the condition for maximum and minimum brightness.
21. Discuss Fraunhofer diffraction at a single slit and obtain an expression for intensity distribution. Also draw the intensity distribution pattern.

(1 × 10 = 10 Marks)