

D 130253

(Pages : 2)

Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS—U.G.) DEGREE EXAMINATION
NOVEMBER 2025**

Physics/Applied Physics

PHY 5B 08/APH 5B 08—OPTICS

(2019 Syllabus)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)**

(Answer **all** questions in two **or** three sentences, each correct answer carries a maximum of
2 marks)

1. Refractive index of glass is 1.5 and that of water is 1.33. If a biconvex lens of glass is immersed in water, will it act as a converging lens? Justify your answer.
2. Does intensities of waves obey superposition principle? Justify your answer.
3. Two monochromatic waves of same intensity I and same wavelength λ interfere at a point. If the two waves are completely incoherent, what will be the resultant intensity?
4. State the condition for constructive interference for a Michelson interferometer and explain the terms therein.
5. How does a Fresnel diffraction differ from a Fraunhofer diffraction?
6. For a plane wave front of monochromatic light, what is the difference in areas of n th and $(n - 1)$ th Fresnel half period zones?
7. Discuss optical activity briefly.
8. How does a hologram differ from a photograph?
9. What role does a reconstruction beam have in holography?
10. What are the essential parts of an optical fiber?

Turn over

11. Display the plot of refractive index of a step index fiber as a function of its radius.
12. Explain pulse dispersion in an optical fiber and list the different mechanisms causing it.

(Ceiling : 20)

Section B (Paragraph/Problem Type)

(Answer **all** questions in a paragraph of about half a page to **one page**, each correct answer carries a maximum of 5 marks).

13. A biconvex lens of refractive index 1.5 has radii of curvatures of 50 cm. and 100 cm. Find the distance to the object if the image has to be formed at 60 cm. from the lens.
14. Wavelength of the light used in a Young's double slit experiment is 500 nm, distance between the slits is 0.5 cm. and the perpendicular distance any slit to the screen is 1 meter. Find the bandwidth.
15. A lamp emits light of different wavelengths the shortest being 500 nm. What is the next higher wavelength that can be resolved at first order using a grating of width 1 inch with 15000 rulings.
16. Velocity of E-ray along the optic axis of a calcite crystal is $1.81 \times 10^8 \text{ ms}^{-1}$ and its velocity perpendicular to the optic axis its $2.02 \times 10^8 \text{ ms}^{-1}$. Find the velocity of E-ray along an axis that is at 45° angle with the optic axis.
17. For light of wavelength 589 nm, the ordinary and extraordinary refractive indices for a quartz crystal are 1.544 and 1.553. Find the thickness of a quarter wave plate made of quartz.
18. Explain qualitatively what a hologram is and how it is made.
19. Derive an expression for numerical aperture of an optical fiber.

(Ceiling : 30)

Part C (Essay Type)

(Essays - Answer in about **two pages**, any **one** question. The question carries 10 marks)

20. Obtain the conditions for maximum and minimum of interference pattern on a parallel thin film.
21. Derive the intensity distribution for diffraction due to N identical slits.

(1 × 10 = 10 marks)