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10683 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER U.G. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS—UG)

Physics/Applied Physics

PHY 5B 08/APH 5B 08—OPTICS

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answer Type)

Answer at least **eight** *questions.*
Each question carries 3 marks.
All questions can be attended.
Overall Ceiling 24.

1. Explain Fermat's principle of stationary time.
2. Discuss the principle of superposition of waves.
3. Explain the terms coherence time and coherence length.
4. Discuss the Rayleigh criterion of resolution.
5. Write down the conditions for maxima and minima for the Newton's rings in the reflected system.
6. Distinguish between Fresnel and Fraunhofer kinds of diffractions.
7. Show a figure illustrating the Huygens wave surfaces produced by a point source embedded in a positive doubly refracting crystal.
8. How is an elliptically polarized light produced ?
9. Distinguish between dextrorotatory and laevorotatory substances.
10. Discuss the basic steps in holography.
11. Distinguish between step index and graded index optical fibers.
12. Discuss the basic parts of a fiber optic sensor.

(8 × 3 = 24 marks)

Section B (Paragraph/Problem Type)

Answer at least **five** *questions.*
Each question carries 5 marks.
All questions can be attended.
Overall Ceiling 25.

13. Obtain the Newtonian lens formula.

Turn over

14. Determine the separation between the coherent sources formed by a biprism whose inc make angles of 2° with its base and the slit is 0.1 m away from the biprism. Given, the index of the material of the prism is 1.5.

15. Calculate the radius of the first dark ring of the Fraunhofer diffraction pattern pro circular aperture of radius 0.02 cm at the focal plane of a convex lens of focal length 20 c that the wavelength of light used is 600 nm.

16. Consider a Fresnel zone plate with radii $r_n = 0.1 \sqrt{n}$ cm. For $\lambda = 5 \times 10^{-5}$ cm, cal positions of the foci.

17. Determine the thickness of a half-wave plate of quartz for a wavelength 500 nm. G refractive indices of the extra-ordinary and ordinary rays are $\mu_e = 1.553$ and μ_o respectively.

18. Discuss the applications of holography.

19. Calculate the numerical aperture and hence the acceptance angle of an optical fiber h and cladding refractive indices 1.45 and 1.40 respectively.

(5 × 5 = 2

Section C (Essay Type)

Answer any **one** *question.*
The question carries 11 *marks.*

20. Discuss the interference by a plane parallel film when illuminated by a plane wave and d conditions for maxima and minima.

21. Obtain an expression for the intensity distribution for the Fraunhofer diffraction due t slit.

(1 × 11 = 1