Reg. No. : ....

Name : ....

Sixth Semester B.Sc. Degree (C.B.C.S.S. – OBE – Regular/Supplementary/ Improvement) Examination, April 2024
(2019 to 2021 Admissions)
CORE COURSE IN PHYSICS
6B11PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 40

SECTION – A

(Short answer six questions. Answer **all** questions. **Each** carries **1** mark.)

1. When white light is used in Newton rings experiment, then all fringes are _____.

2. In Fresnel diffraction, the incident wavefront is _____.

3. The intensity of the principal maxima for a grating of N slits is proportional to _____.

4. Light is polarised to the maximum, when it is incident on a glass surface at an angle of incidence _____.

5. The technique by which image is obtained from a hologram is called as _____.

6. LASER is a short form of _____.

(6×1=6)

SECTION – B

(Short answer eight questions. Answer **any six**. **Each** carries **2** marks.)

7. What is fringe width ? Given an expression for fringe width.

8. Explain the phenomena of colour of thin film.

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9. Why diffraction is common in sound but not common in light ?

10. Define resolving power of a grating.

11. How a quarter wave plate is constructed ?

12. What is the importance of metastable state in the production of laser light ?

13. Distinguish between step index fibre and graded index fibre.

14. Explain the important properties of holograms.

(6×2=12)

SECTION – C

(Problem six questions. Answer **any four**. **Each** carries **3** marks.)

15. Two waves having intensities in the ratio 1 : 9. Find the ratio of the intensity minimum to the maximum.

16. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width 12×10^{-5} am when the slit is illuminated by monochromatic wavelength 6000 A.

17. What is the radius of first zone in a zone plate of focal length 20 cm for light of wavelength 5000 A ?

18. Calculate the thickness of the doubly refracting crystal required to introduce a path difference of $\frac{\lambda}{2}$ between the ordinary and extra ordinary ray when $\lambda = 6000$ A, $\mu_o = 1.55$ and $\mu_e = 1.54$.

19. A glass fibre is made with core glass of refractive index 1.55 and cladding is doped to give a refractive index 1.5. Calculate the numerical aperture, acceptance angle and the fractional index change.

20. In moving one mirror in a Michelson interferometer through a distance of 0.1474 mm, 500 fringes cross the centre of the field of view. What is the wavelength of light ?

(4×3=12)

SECTION – D

(Long essay four questions. Answer **any two**. **Each** carries **5** marks.)

21. Describe the experimental setup for producing Newton's rings by reflected light. Explain how this method is used to measure the wavelength of monochromatic light.

22. Explain the Fresnel diffraction by a circular aperture.

23. How can plane polarized light be produced by reflection ? State Brewster's law. Show that reflected and refracted rays are at right angles during polarization by reflection.

24. What are Einstein's coefficients ? Derive a relation between them.

(2×5=10)

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