(Pages : 4)

T – 1629

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree Examination, April 2024

First Degree Programme under CBCSS

Physics

Core Course XI

PY 1643 : CLASSICAL AND MODERN OPTICS

(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences; each question carries **1** mark.

1. What is fringe width? Given an expression for fringe width.
2. What is coherent source?
3. Why the center of Newton's rings is dark for reflected light?
4. Define resolving power of a grating.
5. Why diffraction is common in sound but not common in light?
6. What is zone plate?
7. Distinguish between ordinary light and polarised light.

P.T.O.

8. State Brewster's law.

9. What are the essential requirements of a laser?

10. Explain population inversion.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions, not exceeding a paragraph; each question carries **2** marks.

11. Write a note on Fresnel's biprism.

12. Define interference. Write an expression for bandwidth of interference fringes.

13. Explain diffraction.

14. What are the assumptions made Fresnel to explain the diffraction pattern?

15. What are the characteristics of grating spectra?

16. Explain how circularly polarized light can be produced.

17. State Malu's law.

18. How a quarter wave plate is constructed?

19. What are Einstein coefficients?

20. What are the advantages of fibre optic communications?

21. Explain the principle and process of holography.

22. What are the applications of holography?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six,** each question carries **4** marks.

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

24. Newton's rings observed in reflected light of $\lambda = 5.9 \times 10^{-7}$ m. The diameter of the 10^{th} ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.

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

26. A parallel beam of monochromatic light is allowed to be incident normally on a plane transmission grating having 5000 lines/cm and the third order spectral line is found to be diffracted through 45°. Calculate the wavelength of the light.

27. What should be the minimum number of lines in a grating which will just resolve in the second order lines whose wavelength are 5890 Å and 5896 Å?

28. When a light is incident on water surface glancing angle of 37°, the reflected light is found to be completely plane polarised? Determine the refractive index of water and angle of refraction.

29. If the critical angle for glass air boundary is 40°. Calculate the polarising angle for glass.

30. A glass fibre is made with core glass of reflective 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.

31. Explain the principle and working of a Ruby Laser.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions; each question carries **15** marks.

32. Describe Michelson's interferometer. Explain how this is used to measure the wavelength of monochromatic light.

33. Explain the Fraunhoffer diffraction pattern due to a single slit.

34. Describe a nicol prism and explain how it can be used for the study of polarization of light.

35. Explain the principle, construction and working of a He-Ne laser.

(2 × 15 = 30 Marks)
