

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2023

First Degree Programme under CBCSS

Physics

Core Course XI

PY 1643 – Classical and Modern Optics

(2014–2017 Admission)

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?
2. Can the light from two separate sources be coherent?
3. What is meant by diffraction of light?
4. What is meant by grating?
5. Distinguish between ordinary light and polarised light?
6. What is optical activity?
7. What is the basic principle of fibre optic communication?

8. What are the essential requirements of a laser?
9. What is optical pumping in laser?
10. What is normal dispersion?

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions not exceeding a paragraph. Each question carries 2 marks.

11. Explain the colours exhibited by thin film?
12. Obtain an expression for bandwidth of interference fringes?
13. What are the condition for producing sustained interference?
14. What is dispersive power of a grating?
15. Explain the diffraction by a circular aperture?
16. Distinguish between ordinary-rays and extra ordinary-rays.
17. How a quarter wave plate is constructed?
18. State and explain Brewster's law?
19. What are Einstein coefficients?
20. Distinguish between step index and graded index fibre?
21. Explain the recording of hologram.
22. What is the difference between holography and photography?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. **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. A parallel beam of sodium light ($\lambda = 589 \times 10^{-9} \text{ m}$) is incident on a thin glass plate ($n = 1$) such that the angle of refraction into the plate is 60° . Calculate the thickness of the plate which will make it appear dark by reflection.
25. In Young's double slit experiment the separation of the slit is 1.9mm and the Fringe spacing is 0.31 mm at a distance of 1 m from the slits. Calculate the wavelength of the light?
26. A plane transmission grating has 14000 lines to an inch for a length of 6 inches. If the wavelength region is $5 \times 10^{-5} \text{ cm}$, find the resolving power of the grating in the first order and the smallest wavelength difference that can be resolved.
27. A monochromatic light of wavelength $5000 \text{ \AA}$ from a distant source falls on a slit 0.5 mm wide. What is the distance between the two dark bands on each side of the central band of the diffraction pattern observed on a screen placed 2m from the slit.
28. Find the half angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width $12 \times 10^{-5} \text{ cm}$ when the slit is illuminated by monochromatic light of wavelength $6000 \text{ \AA}$.
29. If the critical angle of glass air boundary is 38° . Calculate the polarising angle for glass?
30. Calculate the thickness of ice required to act like a half wave plate for a wavelength of 590 nm . $\mu_e = 1.313$ and $\mu_o = 1.309$.

31. 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?

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Describe with necessary theory the determination of wavelength of sodium light using Newton's ring arrangement?
33. What are Fresnel half period zones? Show that the intensity at an point P is only the one —fourth of that due to the first half period zone.
34. Explain the production and analysis of circularly and elliptically polarized light.
35. With energy level diagrams explain the working of Ruby laser.

(2 × 15 = 30 Marks)