

Reg. No. : .....

Name : .....

**Sixth Semester B.Sc. Degree Examination, March 2021**

**First Degree Programme under CBCSS**

**Physics**

**Core Course XI**

**PY 1643 : CLASSICAL AND MODERN OPTICS**

**(2015 – 2017 Admission)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

(Answer **all** questions; each carries **1** mark.)

1. What are coherent sources?
2. What is Fresnel's biprism?
3. Define resolving power.
4. What is a grating?
5. State Malu's law.
6. What is meant by polarization of light?
7. What is a graded index fibre?

8. Define the acceptance angle.
9. What is pumping?
10. What is second harmonic generation (SHG)?

(10 × 1 = 10 Marks)

SECTION – B

(Answer **any eight**; each carries **2** marks.)

11. Explain the phenomenon of colour of thin films.
12. How will you test the optical flatness of glass plate?
13. Compare a zone plate and a convex lens.
14. Give two differences between interference and diffraction.
15. What are negative and positive crystals? Give example for each.
16. Show that the reflected and refracted rays are perpendicular to each other when the angle of incidence is equal to polarizing angle.
17. Write a note on different types of holography.
18. What are the advantages of fiber optic communication system?
19. What are the properties of laser light?
20. What are Einstein's coefficients?
21. Write down Cauchy's and Hartmann dispersion formula.
22. Explain how plane polarized light can be produced.

(8 × 2 = 16 Marks)

## SECTION – C

(Answer **any six**; each carries 4 marks.)

23. A biprism of refractive index 1.5 is kept at a distance of 0.5 m from a slit illuminated by monochromatic light of wavelength  $5890 \text{ \AA}$ . If the distance between the successive fringes formed on the screen at a distance of 1 m from the biprism is 0.12 mm, find the angle of the biprism.
24. In Newton's ring experiment, the radius of curvature of a lens is 5m and diameter of the ring is 2 cm. Calculate the total number of rings formed, if the wavelength of incident monochromatic light is  $5500 \text{ \AA}$ . Calculate the number of rings if the system is kept in water of refractive index 1.33.
25. A plane transmission grating which has 5500 lines per cm is used to produce a spectrum of light from a mercury lamp. What will be the angular separation of the two yellow mercury lines of wavelength  $5770 \text{ \AA}$  and  $5791 \text{ \AA}$  when viewed in the second order.
26. In Fraunhofer diffraction pattern due to a narrow slit, a screen is placed 2 m away from the lens. If the slit width is 0.2 mm, and the first minima lie 5 mm on either side of central maximum, find the wavelength of light used.
27. Calculate the thickness of ice capable of inverting a circularly polarized light.  $\mu_o = 1.309$  and  $\mu_e = 1.313$ . Wavelength of light = 590 nm.
28. A ray of light in air is incident on a glass plate at the polarizing angle. It suffers a deviation of  $26^\circ$  on entering the glass. Calculate the refractive index of glass.
29. The energy level difference between two laser levels is 0.21 eV. Determine the wavelength of radiation.
30. Calculate the numerical aperture and acceptance angle of optical fibre from the following data.  $\mu(\text{core}) = 1.55$   $\mu(\text{cladding}) = 1.50$ .
31. In a wedge shaped film, distance between the successive fringes is measured to be 1.25 mm. The angle of the wedge is 40 seconds. Calculate the wavelength of light used.  $\mu = 1.4$ .

(6 × 4 = 24 Marks)

## SECTION – D

(Answer **any two**; each carries **15** marks.)

32. Describe the construction and working of Michelson interferometer. Discuss how wavelength of monochromatic light can be determined with the help of this interferometer.
33. Explain the principle, construction and working of a ruby laser.
34. Explain with theory the production of circularly polarized and elliptically polarized light waves.
35. Give the theory of plane diffraction grating and how it is used to measure the wavelength of given source of light.

(2 × 15 = 30 Marks)