Reg. No. : ....

Name : ....

Sixth Semester B.Sc. Degree Examination, March 2020
First Degree Programme under CBCSS
Physics
Core Course XI
PY 1643 – CLASSICAL AND MODERN OPTICS
(2014 Admission onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

Answer **all** questions; each carries **1** mark

1.   Define interference.

2.   Give two examples of coherent sources.

3.   What is Rayleigh's criterion for resolution?

4.   State and explain grating law.

5.   Light can be polarised, while sound cannot be. Why?

6.   State Malu's law.

7.   What is the principle of optical fibre?

8.   What is meant by population inversion?

9. Give one advantage of hologram over ordinary photograph.

10. Write Hartmann dispersion formula.

SECTION – B

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

11. Draw the intensity distribution curve of interference pattern.

12. Explain the phenomenon of color of thin films.

13. Define the resolving power of a grating.

14. What are Fresnel's half period zones? Why are they called so?

15. Write two applications of Michelson interferometer.

16. What are negative and positive crystals? Give two examples for each.

17. Explain how elliptically polarised light can be produced.

18. Give four applications of LASER.

19. Explain.stimulated emission of radiation with a neat diagram.

20. What is the difference between a step index fibre and graded index fibre?

21. Define the acceptance angle. Give an expression for it.

22. Explain different types of holograms.

SECTION – C

Answer any **six**; each carries **4** marks

23. The distance between the slit and biprism and between the biprism and the screen are 50cm each. The angle of the biprism is 179° and its refractive index is 1.5. If the distance between successive fringes is 0.0135cm, calculate the wavelength of light used.

24. Light of wavelength 600nm falls normally on a thin wedge shaped film of refractive index 1.4, forming fringes that are 2mm apart. Find the angle of the wedge.

25. If the grating element is $2 \times 10^{-4} cm$. How many order of spectrum are possible for a light of wavelength 650 nm?

26. What is the radius of sixth zone in a zone plate of focal length 10 cm, for a light of wavelength 6000 A°?

27. When sunlight is incident on water surface at a glancing angle of 36°, the reflected light is found to be completely plane polarised. Determine the refractive index of water and angle of refraction.

28. Calculate the thickness of (i) a quarter wave plate, (ii) a half wave plate, given $\mu_0 = 1.973$, $\mu_e = 2.656$, and wavelength = 590nm.

29. Calculate the numerical aperture and acceptance angle of a fibre having core refractive index = 1.5 and cladding refractive index = 1.45

30. The energy level difference between two laser level is 0.21 eV. Determine the wavelength of radiation.

31. A soap film 5×10^{-5} cm thick is viewed at an angle of 35° to the normal. Find the wavelength of light in the visible spectrum, which will be absent from the reflected light, $\mu = 1.33$.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two**; each carries **15** marks

32. Describe an experiment to determine the wavelength of sodium light using Fresnel's biprism.

33. Derive an expression for the intensity distribution in the diffraction pattern of a single slit and draw intensity curve.

34. Explain with theory the production of circularly and elliptically polarised light waves.

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

(2 × 15 = 30 Marks)

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