Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree Examination, April 2019
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. **(10×1=10 Marks)**

1. Can two electric bulbs with point like filament of the same material each 15 watts and lying close to each other produce interference ?
2. Explain what happens to the Newton's rings, if the lower glass plate is replaced by a mirror.
3. What is limit of resolution ?
4. Define optic axis.
5. What is grating ?
6. List the characteristics of single mode step index fibre.
7. What is normal dispersion ?
8. Even a small piece of hologram can have complete information about the object. How ?
9. Define spatial coherence.
10. List atleast three pumping methods.

SECTION – B

Answer **any eight** questions. **(8×2=16 Marks)**

11. What is division of wave front and division of amplitude ?
12. How will you test the planess of glass plate ?
13. Distinguish between Fresnel and Fraunhofer diffraction.
14. Compare the actions of a zone plate with a convex lens.
15. Explain double refraction.
16. What is a quarter and half wave plates ?
17. Give the applications of fibre optic communication system.
18. Explain numerical aperture.
19. What is the principle of holography ?
20. Explain the working principle of semi conductor laser.
21. What is Rainbow holography ?
22. What is pulse dispersion ?

SECTION – C

Answer **any six** questions. **(6×4=24 Marks)**

23. The inclined faces of a biprism ($n = 1.5$) make angles of 1° with the base of the prism. The slit is 10 cm from the biprism and it is illuminated by light of $\lambda = 5900$ Å. Calculate the fringe width observed at a distance of 1 m from the biprism.
24. What is the radius of the first zone in a zone plate of focal length 0.4 m for light of wavelength 5000 Å ?
25. Calculate the thickness of the quarter wave plate of quartz crystal. Given that $n_e = 1.553$ and $n_0 = 1.544$ and λ of light used = 5000 Å.

26. A silica optical fiber of large enough diameter has a core refractive index of 1.50 and cladding refractive index of 1.47. Find

    a) the critical angle at the core-cladding interface.

    b) the numerical aperture for the fiber and

    c) the acceptance angle in air for the fiber.

27. Find the minimum number of lines in a grating, which could fully resolve in the second order the sodium doublet of wavelength 589 nm and 589.6 nm.

28. A glass wedge of angle 0.01 radian is illuminated by monochromatic light of wavelength 6000 Å falling normally on it. At what distance from the edge of the wedge will the 10^{th} fringe be observed by reflected light ?

29. Derive the relation between Einstein's co-efficients.

30. Newton's rings are observed in reflected light of $\lambda = 5.9 \times 10^{-5}$ cm. The diameter of the 10^{th} dark ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.

31. A step index fibre has a core diameter of 200 μm, its numerical aperture is 0.29. Calculate the number of propagating modes of an operating wavelength of 859 nm.

SECTION – D

(2×15=30 Marks)

Answer **any two** questions.

32. Describe with a neat sketch, Michaelson's interferometer. Explain how it can be used to determine wavelength of light.

33. Describe the method of producing and analysing plane, circularly and elliptically polarised light.

34. Give the theory of normal and anomalous dispersion and describe how the latter has been studied in the case of sodium vapour.

35. With neat ray diagrams, explain the principle of recording hologram and reconstruction of the image.