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Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree Examination, April 2017
First Degree Programme under CBCSS
PHYSICS
Core Course – XI
PY 1643 : Classical and Modern Optics
(2014 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. What is semiconductor laser ?
2. What is optical pumping ?
3. What is transmission type hologram ?
4. What is an optical fibre ?
5. What is anomalous dispersion ?
6. State Malu's law.
7. Name an optical device used for analysing plane polarised light.
8. What is a zone plate ?
9. Why do we use X-rays in crystallographic studies ?
10. State Brewster's law.

(10×1=10 Marks)

SECTION – B

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

11. Briefly describe the construction of non-reflecting films.
12. Explain a method to construct zone plate.

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13. How is population inversion achieved in semiconductors ?

14. Differentiate between single mode fibre and multimode fibre.

15. How do we get circularly polarised light using nicol prism ?

16. Explain the use of Polaroid films.

17. What is the difference between dichroism and dichroic ?

18. Explain pulse dispersion in step index fibre.

19. Briefly describe transmission and reflection type holograms.

20. Discuss the elementary theory of dispersion.

21. Explain the Rayleigh's criterion for resolution.

22. What is graded index fibre ? Explain. (8×2=16 Mark

SECTION – C

Answer **any six** questions; **each** question carries **4** marks.

23. Light of wavelength 6000 Å falls normally on a thin wedge shaped film of refractive index 1.5. Fringe separation is 1.9 mm. Find the angle of the wedge.

24. In Newton's rings arrangement, if a drop of liquid of refractive index 1.33 is placed in between lens and the plate, the diameter of the 5^{th} fringe is found to be 0.6 cm. Calculate the radius of curvature of the lens. Wavelength of the light is 6000 Å.

25. In order to obtain Fraunhofer diffraction using light of wavelength 5000 Å, the screen is placed at a distance of 2 m away from the lens. The first minima are found to be at 5 mm on either side of the central maximum. Find the width of the slit.

26. If the ratio of intensities of extraordinary ray and ordinary light is 3, find the angle between the plane of vibration of the incident beam and optic axis.

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27. Calculate the thickness of half wave plate to produce plane polarised light for a wavelength of 5000 Å. Given $\mu_E = 1.553$ and $\mu_0 = 1.544$.

28. Relative atomic population of hydrogen gas at the first excited level is 2.5×10^{-9}. Calculate the temperature. (E1 = – 13.6 eV and E2 = – 3.39 eV).

29. Derive the Einstein Coefficients.

30. What is the radius of the second zone in a zone plate of focal length 10 cm for a light of wavelength 5000 Å ?

31. Refractive indices of core and cladding of an optical fibre are 1.56 and 1.51 respectively. Calculate the numerical aperture and acceptance angle of the fibre.

(6×4=24 Marks)

SECTION – D

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

32. Discuss the theory of interference fringes using Young's double slit experiment.

33. Discuss the theory of production and analysis of elliptically polarised light.

34. Qualitatively describe the principle, recording and reconstruction of image using holographic method.

35. What is population inversion ? Briefly discuss the construction and working principle of Ruby laser.

(2×15=30 Marks)

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