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Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree Examination, April 2018
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** question carries **1** mark.

1. What is LASER ? Mention one application.
2. What is spatial coherence ?
3. What is a reflection type hologram ?
4. What is a light pipe ?
5. What is normal dispersion ?
6. What is plane polarised light ?
7. What is double diffraction ?
8. What are coherent sources ?
9. Name the parameters recorded in a hologram.
10. Discuss the nature of Newton's rings produced with white light. **(10×1=10 Marks)**

SECTION – B

Answer **any eight** questions. **Each** question carries **2** marks.

11. What are the applications of Michelson's interferometer ?

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12. Discuss the intensity variation in interference pattern with reference to law of conservation of energy.

13. Distinguish between Fresnel and Fraunhofer diffraction.

14. Draw the energy level diagram of ruby laser.

15. Discuss optical activity and give examples of optically active materials.

16. Write down the criterion for the resolution of an optical instrument according to Lord Rayleigh.

17. How do we get plane polarised light using nicol prism ?

18. Briefly discuss the advantages of optical fibre in communication system.

19. Name any three laser systems. Give at least one important feature of each system.

20. Derive an expression for numerical aperture.

21. What are the differences between single mode fibre and multimode fibre ?

22. Differentiate between quarter and half wave plate. **(8×2=16 Marks)**

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SECTION – C

Answer **any six** questions. **Each** question carries **4** marks.

23. In Young's double slit experiment ; a fringe of spacing is 0.34 mm is formed at a distance of 1 m from slit separated by 1.8 mm. Calculate the wavelength of light.

24. In Newton's rings experiment, the diameter of the 19^{th} ring was found to be 0.59 cm and that of 9^{th} ring 0.336 cm. If the radius of the plano-convex lens is 100 cm, calculate the wavelength of light used.

25. Using Newton's rings, derive an expression to calculate the refractive index of a liquid.

26. Calculate the polarising angle for a material of refractive index 1.52.

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

28. Estimate the relative atomic population of hydrogen gas at 30°C at the first excited level. ($E_1 = -13.6$ eV and $E_2 = -3.39$ eV)

29. Derive Einstein's coefficients.

30. Calculate the radius of the first zone in a zone plate of focal length 10 cm for a light of wavelength 4000 Å.

31. Refractive indices of core and cladding of an optical fibre are 1.55 and 1.50 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. Describe Michelson's interferometer. How is the wavelength of monochromatic light determined ?

33. Discuss the theory of Fraunhofer diffraction pattern at a single slit.

34. Discuss Huygen's explanation of double refraction in uniaxial crystals.

35. What is optical resonator ? Briefly discuss the construction and working principle of He-Ne laser.

(2×15=30 Marks)

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