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A – 2028

Reg. No. :

Name :

Final Year B.Sc. Degree Examination, April 2016
Part – III, Group – II : PHYSICS
Paper – IV : Optics and Electromagnetic Theory
(2006 Admission) (Mercy Chance)

Time : 3 Hours

Max. Marks : 50

PART – A

Answer **any two** questions. **Each** question carries **7** marks.

1. Discuss the formation of interference fringes on a screen due to the monochromatic light passing through two parallel slits on an opaque screen. Also arrive at the expression for fringe width.
2. Give the theory of plane transmission grating and show how would you use it to determine the wavelength of monochromatic light.
3. What is a quarter wave plate ? Explain its construction and use. How will you use it to produce beam of elliptically and circularly polarized light ?
4. Describe the principle and working of the Ruby Laser. **(2x7=14 Marks)**

PART – B

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

5. What is meant by spherical aberration for a thin lens ?
6. Explain the defects – astigmatism and coma.
7. What is an eye-piece ? What is its advantage over a single lens ?
8. Explain nodal points and nodal planes.
9. Distinguish between interference and diffraction.
10. What do you mean by resolving power of optical instruments ?
11. Distinguish between Fresnel diffraction and Fraunhofer diffraction.
12. Explain the phenomenon of double refraction.
13. Explain Brewster's law.

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14. Explain normal and anomalous dispersion.
15. What is population inversion ? How it is achieved ?
16. What is holography ?
17. Distinguish between step index fiber and graded index fiber.
18. What do you mean by dispersive power ?
19. Write down Maxwell's fundamental electromagnetic wave equations.
20. Explain the significance of Poynting's theorem. (12×2=24 Marks)

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

21. The diameter of the central zone plate is 2.3 mm. If a point source of wavelength 5893Å is placed at a distance of 6 m from it, calculate the position of the first image.
 22. In an experiment with Michelson's interferometer, the distance travelled by the mirror for two successive positions of maximum distance was 0.2945 mm. If the mean wavelength for the two components of sodium D lines is 5893Å , calculate the difference between them.
 23. A ray of light is incident on a glass plate of refractive index 1.655 at the polarizing angle. Calculate the angle of refraction.
 24. A convex refracting surface of radius of curvature 15 cm separates two media of refractive indices 1.33 and 1.5. An object is placed in the first medium at a distance of 240 cm from the surface. Calculate the position of the image.
 25. In an optical fiber, the core material has refractive index 1.6 and that of clad material is 1.3. Calculate the value of critical angle. Also calculate the value of acceptance of the cone.
 26. A plane polarized light is incident perpendicularly on a quartz plate cut with faces parallel to the optic axis. Find the thickness of quartz plate, which introduces a phase difference of 60° between the e- ray and o-ray (Given $\mu_e = 1.553$ and $\mu_o = 1.544$)
 27. Calculate the focal lengths of a convex of crown glass (dispersive power 0.0120) and a concave lens of flint glass (dispersive power 0.020), so that when placed in contact, they form an achromatic converging combination of focal length 30 cm. (4×3=12 Marks)
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