Reg. No..... (Pages 2) **K 5114**

Name.....

FINAL YEAR B.Sc. DEGREE EXAMINATION
MARCH/APRIL 2005

Part III—Group I—Physics

Paper III—CLASSICAL AND MODERN OPTICS

Time : Three Hours Maximum : 50 Marks

Section A

Answer any **two** *questions.*
Each question carries 6 *marks.*

1. Describe Fresnel's biprism. Explain how the wavelength of monochromatic source of light can be determined with help.
2. Derive Cauchy's dispersion formula.
3. Describe the construction and action of a Nicol prism.
4. Discuss the reflection and transmission of electro magnetic waves in conductors.

(2 × 6 = 12 marks)

Section B

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

5. What are the cardinal points of a coaxial optical system ? Explain.
6. Why do we prefer a convex lens of large radius of curvature for producing Newton's rings ?
7. Explain Lummer-Gehrcke plate.
8. Distinguish between interference and diffraction of light.
9. Explain Roman effect based on quantum theory.
10. Describe Kerr electro optic effect.

(4 × 3 = 12 marks)

Section C

Answer any **seven** *question's.*
Each question carries 2 *marks.*

11. Obtain the relation $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ for a thin convex lens by matrix method.
12. What is meant by chromatic aberration of a lens ?
13. What is the need for a multiple eyepiece in optical instruments ?
14. In what respects Lloyd's single mirror fringes differ from those of biprism fringes.

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15. Explain why different colours are exhibited by a thin transparent film in white light.
16. What are the uses of Michelson's interferometer ?
17. What are the applications of holography ?
18. Distinguish between positive and negative Crystals.
19. What is meant by graded index fibre ?
20. What is meant by purity of a spectral line ?
21. Write down Maxwell's equations for electro magnetic waves.

(7 × 2 = 14 marks)

Section D

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

22. When a thin sheet of transparent material of thickness 7.2×10^{-6}m is introduced in the path of one of the interfering beams, the central fringe shifts to a position occupied by the 6^{th} bright fringe. If $\lambda = 6 \times 10^{-7}$m, find the refractive index of the sheet.
23. Light of wavelength 6000 Å passes through a narrow aperture of radius 0.9×10^{-3}m. At what distance along the axis will the first maximum intensity be observed in the diffraction pattern ?
24. A ray of light in air is incident on a glass plate at the polarising angle. It suffers a deviation of 22° on entering the glass. Calculate the angle of polarisation.
25. A relative population or Boltzmann ratio of i/e is often considered representative of the ratio populations in two energy states at rooms temperature (T = 300K). Calculate the wavelength of the radiation emitted at that temperature.
26. Given the dispersive powers of the crown and flint glasses as 0.2 and 0.4 respectively, find the focal lengths of the components of an achromatic doublet of focal length 20 cm.
27. A lens of diameter 2 m could focus a laser beam of wavelength 6000 Å on moon, at a distance of 4×10^8 m. What will be size of the spot on the moon ?
28. The intensity of sunlight hitting the earth is about 1300 W/m^2. If sunlight strikes a perfect absorber, what pressure does it exert ? How about a perfect replector ?

(4 × 3 = 12 marks)