

(i) Printed Pages : 4

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(ii) Questions : 7

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Exam. Code :

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B.A./B.Sc. (General) 3rd Semester

(2123)

PHYSICS

Paper : B (Optics & Lasers-I)

Time Allowed : Three Hours]

[Maximum Marks : 44

Note :—Attempt *five* in all, selecting *two* questions each from Unit-I, Unit-II and Unit-III is compulsory. Use of Non-Programmable calculators and log tables are allowed.

UNIT—I

1. (a) Deduce the expression of intensity distribution of interference fringes obtained using Fabry-Perot interferometer. Also explain the role of Fineness in it.
- (b) In a Fresnel's biprism experiment, the focal plane of eye piece is at 1 m from the slits. The slit is illuminated with sodium light and the fringe width is to be 0.172 mm. A lens of short focal length placed between the biprism and eye piece. The lens, when adjusted near the biprism produces the two images of slits separated by 4.34 mm and when adjusted near the eye piece produces two images of the slit separation by 2.71 mm. Calculate the wavelength of the sodium light.

5,4

2. (a) What are Newton rings ? Explain the formation of bright and dark rings and hence derive the expression for the measurement of wavelength of light.
- (b) In a double slit experiment, the two slits are illuminated with a light of wavelength 450 nm. If the slits are separated by 2.5 mm and slit to screen distance be 100 cm, find the distance of the third bright and dark fringe on either side of central maxima. 5,4
3. (a) Explain analytically the colour of thin films and show that reflection and transmission pattern is complimentary to each other.
- (b) Explain and differentiate between division of wave-front and division of amplitude. What is Stoke's law about phase change on reflection ? 5,4

UNIT—II

4. (a) Discuss the Fraunhofer diffraction due to double slit and derive the expression of its missing orders. Explain how the diffraction pattern of double slit differs from single slit.
- (b) The innermost half period zone of a zone plate has a diameter of 0.5 mm. Find the focal length of the plate when used with a light of 550 nm. Also find the first subsidiary focal length. 5,4

5. (a) Explain the Rayleigh's criterion of resolution and determine the relation of resolving power of microscope.
- (b) A microscope with oil immersion objective can just resolved 101.6 lines per inch. Wave length of light is 4000 \AA . Calculate the numerical aperture of the objective required to just resolve the lines. 5,4
6. (a) Explain construction of Nicol Prism. How it is used to produce linearly polarized light ?
- (b) The value of μ_e and μ_o for quartz are 1.5508 and 1.5418 respectively. Calculate the phase retardation for $\lambda = 5000 \text{ \AA}$ when the plate thickness is 0.032 mm. 5,4

UNIT—III

Attempt any *eight* questions :

7. (a) Why broad source of light is necessary for observing colours in thin films ?
- (b) Why central point in Lloyd's mirror method is a dark point ?
- (c) Can our eye distinguish polarized light from the unpolarised light ?
- (d) If we look at sun through a piece of muslin/silen cloth, we observe coloured streaks at the sight of holes in the cloth. Explain why ?

- (e) State Malus law.
- (f) Write down the conditions for sustained interference.
- (g) Why X-rays diffract from crystal lattice and not from the plane transmission grating ?
- (h) What are ordinary (O) and extra-ordinary (E) rays ?
- (i) Why are Polaroids used in wind screens ?
- (j) What is a compensating plate and why it is called so ?

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