

PHYSICS PAPER-B

(Optics and Lasers-I)

Time Allowed : 3 Hours

Maximum Marks : 44

- Note: (i) Attempt five questions in all, selecting two questions each from Section A and Section B.
- (ii) Section C (Q. No. 7) is compulsory for all.
- (iii) Log tables and calculators are allowed.

SECTION A

- (a) Discuss the phenomenon of interference in thin films. Obtain the condition for maxima and minima. 6

(b) What is non-reflecting film? Derive an expression for the required thickness of antireflection coating. 3
- Describe the principle and construction of Michelson's interferometer. Also explain how circular fringes are produced in Michelson's interferometer. 9

3. (a) What is coherence ? Discuss the terms temporal coherence and spatial coherence. 6
- (b) A Fresnel biprism is placed at a distance of 5 cm from a slit illuminated by sodium light of $\lambda = 5890 \text{ \AA}$. The width of fringes obtained on a screen 75 cm from the biprism is $9.4 \times 10^{-2} \text{ cm}$. Find the distance between two coherent sources. 3

SECTION-B

4. (a) What is zone plate ? Show that the radii of its half period zones are proportional to the square root of natural numbers. 6
- (b) How many orders will be visible if the wavelength of incident radiation be 5000 \AA and the number of lines on the grating be 7620 to an inch. 3
5. (a) Discuss the Fraunhofer diffraction pattern due to single slit. Find the expression for the width of central maximum. 6
- (b) Find the separation of two points on the moon that can be resolved by a 500 cm telescope. The distance of the moon is $3.8 \times 10^5 \text{ km}$. The eye is most sensitive to the light of wavelength 5500 \AA . 3
6. (a) What do you understand by double refraction ? What are ordinary and extra-ordinary rays and how will you show that these are plane polarized ? 6
- (b) Two Nicol prisms are set so that maximum light is transmitted. Through what angle should one of the prisms be rotated to reduce the intensity to one half ? 3

SECTION-C

7. Attempt any eight parts :
- (i) Explain what happens when the width of slit in Fresnel biprism arrangement is increased.
- (ii) What is principle of Fabry Perot interferometer ?
- (iii) What are coherent sources ?
- (iv) Why diffraction of sound is more evident in daily experience than that of light waves ?
- (v) What is diffraction grating ?
- (vi) What is resolving power of optical instrument ?
- (vii) Distinguish between polarised and unpolarised light.
- (viii) What is double refraction ?
- (ix) What do you mean by Moire's fringes ?
- (x) What is multiple beam interference ?

1×8=8