(i) Printed Pages : 4] Roll No. .....

(ii) Questions : 7] **Sub. Code :** 0 2 4 8

Exam. Code : 0 0 0 3

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

1127

PHYSICS

(Optics and Lasers–I)

Paper : B

Time : 3 Hours] **[Max. Marks : 44**

Note :– Attempt *five* questions in all, selecting *two* questions from each Section–A and Section–B. Section–C, (Q. No. 7) is compulsory. Log tables and calculator are allowed.

Section–A

1. Discuss the phenomena of interference in thin films. Obtain the condition for maxima and minima. Show that the interference patterns in the reflected and transmitted system are complementary. 9

2. (a) Give the experimental details for the production of Newton's rings. Obtain the conditions for dark and bright fringes both in reflected and transmitted system. 6

(b) A parallel beam of light 5890 Å is incident on a glass plate having refractive index 1.5 such that the angle of refraction in the plate is 60°. Calculate the smallest thickness of glass plate which will appear dark by reflected light. 3

3. (a) What is meant by interference by division of wave front and division of amplitudes ? How you can obtain the interference using Fresnel's biprism ? Describe in detail how Fresnel's biprism is used to determine wavelength of unknown light source ? 6

(b) The wavelength of two components of D-lines of sodium are 5890 Å and 5896 Å. By how much distance one of the mirrors of Michelson's interferometer be moved so as to obtain consecutive positions of maximum distinctness ? 3

Section–B

4. Discuss the diffraction pattern produced by a circular aperture. Show that radius of central disc decreases with the increase of diameter of the aperture. What is its importance in optical instruments ? 9

5. (a) Discuss the effect of diffraction of the images formed by optical instruments. Explain Rayleigh's criteria of resolution. Derive an expression for resolving power of telescope. 6

   (b) What is the radius of third half period zone of a zone plate having focal length 0.2 meter and illuminated by light of wavelength 5000 Å ? 3

6. (a) What do you understand by double refraction ? Explain double refraction through uniaxial crystal. Which of the two rays i.e. O-ray or E-ray travels faster along a direction other than the optical axis in positive crystal ? 6

   (b) Two polaroids are adjusted so as to obtain maximum intensity. Through what angle should one polariod to be rotated to reduce the intensity to (i) half and (ii) one fourth. 3

Section–C

7. Attempt any *eight* parts :

(i) Why broad source of light is required to observe interference in case of thin film ?

(ii) Define coherence length and coherence time.

(iii) What are Moire's fringes ? Give scientific applications of these fringes.

(iv) Define resolving power and limit of resolution for any optical instrument.

(v) Why the light waves are generally characterized by electric vector although it is electromagnetic in nature ?

(vi) Why X-rays diffract from crystal lattice and not from the plane transmission grating ?

(vii) Tell why, the Sun appears reddish during sunset and sunrise.

(viii) What are quarter and half wave plates ?

(ix) What are ordinary (O) and extra-ordinary (E) rays ?

(x) State the Brewster's law in polarisation of light waves. 1×8=8