

(i) Printed Pages : 3

Roll No. ....

(ii) Questions : 7

Sub. Code : 

0	2	4	8
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Exam. Code : 

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B.A./B.Sc. (General) 3<sup>rd</sup> Semester

(2122)

PHYSICS

Paper : B (Optics & Lasers-I)

Time Allowed : Three Hours]

[Maximum Marks : 44

Note :— Attempt five questions in all, including Question No. 7 (Unit-III) which is compulsory and selecting two questions each from Unit I-II. Use of non-programmable scientific calculator is allowed.

UNIT—I

1. What is meant by multiple beam interferometry ? Discuss the phenomena of interference in thin films. Show that the interference patterns in the reflected and transmitted system are complimentary. 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.  
(b) A parallel beam of light  $5890 \text{ \AA}$  is incident on a glass plate having refractive index 1.5 such that the angle of refraction in the plate is  $60^\circ$ . Calculate the smallest thickness of glass plate which will appear dark by reflected light. 6,3

3. (a) Derive expression for intensity distribution of the interference fringes obtained using Fabry-Perot Interferometer. Also, define the coefficient of finesse.
- (b) Light of wavelength 450 nm falls normally on a slit of width  $3.5 \mu\text{m}$ . Determine the angular position of second and third minima. 6,3

### UNIT—II

4. (a) What are Fresnel's zones, why they are known as half-period zones ? Using half-period zones prove the rectilinear propagation of light.
- (b) Distinguish between Fresnel's and Fraunhofer diffraction. 6,3
5. (a) 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 ?
- (b) Show that in a diffraction grating with grating element  $1.5 \times 10^{-6}\text{m}$ , higher order principle maxima are not visible for light of wavelength 550 nm. 6,3
6. (a) Discuss the production and analysis :
- (i) plane polarized
  - (ii) circularly polarized, and
  - (iii) elliptically polarized light using different polarizers and analyzers.

- (b) Find the thickness of Calcite prism to introduce a path difference of  $\lambda/2$  between O-ray and E-ray produce for light of wavelength  $5000 \text{ \AA}$ . Given  $\mu_o = 1.54$  and  $\mu_e = 1.56$ .

6,3

### UNIT—III

7. Attempt any **eight** parts :

- (i) What are coherent sources ? How we can obtain them practically ?
- (ii) Write down the conditions for sustained interference.
- (iii) Define the area of coherence.
- (iv) Why the central circular fringe in Michelson's interferometer is always dark ?
- (v) State Rayleigh's Criterion for resolution of diffraction pattern.
- (vi) Why X-rays diffract from crystal lattice and not from the plane transmission grating ?
- (vii) Tell why, muslin cloths shine in presence of light.
- (viii) What are Moire's fringes ?
- (ix) What are ordinary (O) and extra-ordinary (E) rays ?
- (x) State the Brewster's law in polarisation of light waves.

1×8=8