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

(1129)

PHYSICS

Paper–B (Optics & Lasers–I)

Time Allowed : **Three Hours]**   **[Maximum Marks : 22**

Note :—Attempt **FIVE** questions in all, selecting **TWO** questions each from Units–I & II. Unit–III is compulsory. Use of non-programmable calculator is allowed.

UNIT—I

1. (a) Explain analytically the colours when a thin film illuminated by white light is observed in transmitted system.

   (b) In Lloyd's mirror interference experiment the source slit is at a perpendicular distance of 1.5 mm from the plain mirror. The interference fringes observed on a screen at a distance of 1.0 m from the slit, have a separation of 0.200 mm. Calculate the wavelength of light.   3,1½

2. Explain the principle and working of Michelson interferometer. How will you measure small difference in wavelength of two waves ?   4½

3. (a) Describe an experimental arrangement for production of Newton's rings by reflected light. Prove that the diameter of the dark rings are proportional to the square root of the natural numbers.

(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 the slit to screen distance be 1 m, find the distance of the third (i) bright (ii) dark fringe on either side of the central maximum.   3,1½

UNIT—II

4. (a) Discuss Fraunhoffer diffraction at a single slit. Find width of central maxima.

(b) Discuss Rayleigh criterion of resolution. Derive an expression for the resolving power of telescope. 3,1½

5. (a) Give construction, theory and working of Zone plate. How does it resemble with a lens ?

(b) A plane grating has 15000 lines per inch. Find the angular separation of 5048 Å and 5016 Å of helium in the second order spectrum.   3,1½

6. (a) Explain the construction and working of quarter wave plate. How is it used to produce elliptically and circularly polarized light ?

(b) Unpolarized light falls on two polarizing sheets placed one on top of the other. What must be the angle between the transmission directions of the sheets if the intensity

of transmitted light is 1/3rd of the maximum intensity of the transmitted beam ? Consider that the sheet is ideal i.e. it reduces the intensity of unpolarized light by exactly 50%. 3,1½

UNIT—III

7. Attempt any **EIGHT** parts :—

(a) Define spatial coherence.

(b) In interference with white light, fringe width of red coloured fringes is double than that of violet coloured. Why ?

(c) What is the type of fringes formed in Fabry-Perot interferometer ?

(d) Why is the central point in Lloyd's mirror method a dark point ?

(e) What do you mean by visibility of fringes ?

(f) If we look at the Sun through a piece of muslin/silken cloth, we observe coloured streaks at the sight of holes in the cloth. Explain why.

(g) What are moire fringes ?

(h) On what factors does the width of central maxima of a grating depend ?

(i) What is meant by crossed polaroids ?

(j) What is the difference between positive and negative crystals ? ½×8=4