First Year Examination of the Three Year

Degree Course, 2001

(Faculty of Science)

PHYSICS

Paper II

(Optics)

Time - Three Hours

Maximum Marks - 50

Attempt **Five** question in all,

selecting **ONE** question from each unit.

All questions carry equal marks.

UNIT I

1. Deduce Newton's formula for a converging lens forming a real image. What do you understand from Nodal points and Nodal planes? 6+2+2

OR

2. What do you understand by the term achromatism of a lens? Derive the condition of achromatism for two thin lensews of focal lengths f1 and f2 made of same material but separated by a distance.

UNIT II

3. (a) Discuss the coherence of an ordinary source of light and a lasersource of light. Can a two-level laser be constructed? 2+2+2

   (b) In a michelson interferometer, 200 fringes cross the field of view when the movable mirror is displaced through 0.05896 mm. Calculate the wavelength of monochromatic light used.

OR

4. Explain the construction of a Febry-Perot interferometer and explain its action. Explain colour effects in Thin films. 3+3+4

UNIT III

5. Describe the construction of Half-Period zones. A circular opaque disc of diamerter 1 cm is placed at a distance of 1 meter from a point source of light (= 6000 A). The diffraction pattern is observed at a distance of 2 meters from the disc. Calculate the number of Fresnel zones covered by the disc.

6+4

OR

6. Discuss the Fresnel diffraction pattern due to a straight edge. Give the necessary theory.

UNIT IV

7. (a) What do you understand by the resolving power of a telescope? Deduce an expression for resolving power of a telescope.

   (b) Calculate the limiting angle '0' which two distant separated star should subtend on the objective of one inch aperture telescope so as to be just resolved by it. (1 inch = 2.54 cm.) The effective wavelength of light is 5500 A.

OR

8. (a) Discuss Fraunhoffer diffraction due to a single slit. Explain the basic difference between the diffraction spectra of a single slit and a plane transmission grating.

3+3

   (b) A double slit is illuminated with light of wavelength = 4800 A. The slits are separated by 0.1 mm and the slit width is 0.020 mm. The Fraunhoffer diffractions pattern is observed on a screen 50 cm away from the slits. Calculate the fringe spacing.

UNIT V

9. Discuss the state of polarisation of emergentlight in following cases :-

(i) A plane polarised light falls normally on a half ave plate when vibration direction is at 45 degree with the optic axis of the plate, the optic axis being parallel to the face.

(ii) A plane polarised light falls normally on a quarter wave plate at an angle other than 45 degree with the optic axis which is parallel to the face of plate. (exclude 0 and 90)

(iii) A plane polarised light falls normally on a quarter wave plate at an angle-45 with the optic axix which is parallel to the face to plate.

(iv) A plane polarisee light falls normally on a quarter wave plate with optic axis perpendicular to the face. 3+2+2+3

OR

10. (a) Describe a Laurant's half-shade polarimeter for determination of specifc rotation of sugar solution. 6

(b) Find the specif rotation of a given sample of sugar solution if the plane of polarisation is turned through 26.4 degree. The length of tube containing 20% concentration sugar solution is 20 cm. 4