5218

B. Sc. EXAMINATION

(Fourth Semester)

PHYSICS

Paper VIII

Wave and Optics

Time : Three Hours   *Maximum Marks :* 40

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. Select *one* question from each Unit. Use of scientific (non-programmable calculator is allowed.

1. (a) Is optic axis in a crystal a line or direction ?   1

   (b) What are directions in which extra ordinary rays are polarised ?   1

   (c) Write Fourier transform of function $f(x)$ of x for $-\infty < x < \infty$.   1

(d) What is similarity theorem of Fourier transform ? 1

(e) Why is matrix method superior to the old conventional method to find the position of the image in an optical system ? 2

(f) Explain the term longitudinal and lateral chromatic abberations. 2

Unit I

2. (a) Explain how a beam of plane polarized light may be regarded as compared of two equal and opposite circularly polarised light. 6

(b) A sugar solution in a tube of length 0.2 cm produces optical rotation of 13° with light of wavelength λ = 6000 Å. Find the strength of the solution. Given specific rotation of sugar is 65°. 2

3. (a) What do you understand by double refraction ? What are ordinary and extraordinary rays and how can you show that they are plane polarized ? 6

(b) A beam of light is incident on a glass plate at an angle of 58°6' and the reflected beam is completely plane polarized. Find the refractive index of glass.   2

Unit II

4. (a) State Fourier's theorem and determine the values of Fourier's coefficients.   6

 (b) Define Fourier sine series and half range series.   2

5. Apply Fourier's theorem in the analysis of the output of a full wave rectifier.   8

Unit III

6. (a) State inverse Fourier's transform and find the Fourier transform of Gaussian function :   6

$$f(x) = e^{x^2/2}$$

 (b) Find the sine transform of e^{-x}.   2

7. (a) What is translatioin matrix ? Find the system matrix for thin lenses and derive thin lens formula. 6

(b) A thick lens of thickness 2 cm and having radii of curvature +6 cm and –6 cm made up of material of refractive index 1.5 is placed in air. Find the system matrix focal length and the position of unit points and nodal points. 2

Unit IV

8. (a) Explain the defects : astigmatism, coma and curvature. Explain how they can be minimised ? 6

(b) For the achromatic combination of two lenses to the convex, the focal length of convex lens should be less than that of concave lens why ? 2

9. (a) What is an optical fibre ? Explain its various types. 6

(b) Explain normalized frequency (V-number). What is its importance ? 2