

Roll No. ....

(04/17-I)

**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 extraordinary 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 aberrations. 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  $13^\circ$  with light of wavelength  $\lambda = 6000 \text{ \AA}$ . Find the strength of the solution. Given specific rotation of sugar is  $65^\circ$ . 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  $58^{\circ}6'$  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. https://www.cdluonline.com 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 translation 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

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