Roll No. ..... Total Pages : 3

GSM/M-20 **1619**

PHYSICS

(Wave and Optics–II)

Paper–VIII

Time Allowed : 3 Hours] [Maximum Marks : 40

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks. Use of Scientific (non-programmable) calculator is allowed.

Compulsory Question

1. (a) What is the limitations of Nicol Prism as Polarizer ? 2

   (b) Write the complex form of Fourier series. 2

   (c) What is a system matrix ? 2

   (d) What is a crossed lens ? What is its use ? 2

UNIT–I

2. (a) What do you understand by Double refraction ? Explain Huygen's theory of double refraction in uniaxial crystal. What are positive and negative crystals ? Give examples. 6

(b) A ray of light strikes a glass plate at an angle of incidence 60°. If the reflected ray and refracted rays are perpendicular to each other, find the refractive index of glass ? 2

3. (a) Describe the action of Bi-quartz plate in Bi-quartz polarimeter. Also give relative merits of half-shade and Bi-quartz. 6

(b) What is the specific rotation of an optically active substance ? 2

UNIT–II

4. (a) What are the limitations of Fourier theorem ? Explain them. 3

(b) Apply the Fourier theorem to analyse a square wave into its simple harmonic components. 5

5. (a) State and prove Fourier integral theorem. 6

(b) Give Fourier integral for General form. 2

UNIT–III

6. (a) Define infinite and finite Sine transform. 4

(b) Find the Fourier transform of Gaussian function

$$f(x) = e^{-\frac{x^2}{2}}.$$

7. (a) What is the effect of refraction ? Discuss the method for the formation of (2×2) refraction matrix. 4

(b) Derive an expression for focal length of a thin lens by the method of using system matrix for its under paraxial approximation. 4

UNIT–IV

8. Explain the aberrations Coma and Astigmatism. How these can be minimised ? 8

9. (a) What is Pulse dispersion in an Optical Fibre ? What are the different mechanisms due to which pulse dispersion take place ? Explain. 6

(b) Calculate the critical angle between two material with indices of $r_1 = 1.45$ and $r_2 = 1.40$. 2