Roll No. .....

(09/20-I)

5218

B. Sc. EXAMINATION

(For Re-appear Candidates Only)

(Fourth Semester)

PHYSICS

Paper–VIII

Wave and Optics–II

Time : Three Hours *Maximum Marks :* 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

1. (a) Explain Specific Rotation.

(b) Highlight importance of Fourier Transform.

(c) Explain Parseval Identity.

(d) Define Optical Activity.

(e) Explain Coma Aberrations.

(f) What are the advantages of Fiber Optic Communications ? 8

Unit I

2. (a) State and explain the Law of Malus. 4

(b) A tube 50 cm long filled with an aqueous solution containing 1.5 gm cane sugar per 100 CC of solution is placed in the path of plane polarized light. Find the rotation of the plane of polarization. Specific rotation of sugar is 66.5. 4

3. What do you understand by a quarter-wave plate and a half-wave plate ? Calculate their thickness and explain what will happen when they are placed in the path of a plane-polarized beam ? 8

Unit II

4. (a) State and prove Fourier Integral Theorem. 4

(b) Find a series of sines and cosines of multiples of x which will represent $f(x) = x + x^2$ for $-\pi < x < \pi$. 4

5. (a) Derive the complex form of Fourier Series. 4

(b) Consider a periodic force of the form :

$$F(t) = F_0 \sin \omega t \text{ for } 0 < t < \frac{T}{2}$$

$$= 0 \qquad \text{for } \frac{T}{2} < t < T$$

and $F(t + T) = F(t)$ with $\omega = \frac{2\pi}{T}$.

Find the Fourier series for this function. 4

Unit III

6. Develop fourier cosine and sine transforms and describe the procedure to solve a second order differential equation of the form $\frac{d^2\psi}{dx^2} = \propto \frac{d\psi}{dx}$ using Fourier transform. 8

7. Deduce a formula for equivalent focal length of a two thin concave lens system. Also determine the position of second principal plane and second focal point. 8

Unit IV

8. What is Spherical Aberration in Lenses ? How is it measured ? Further explain various methods to remove it. 8

9. Explain Optical Fiber. Derive expression for critical angle of propagation and numerical aperture. 8