Roll No. .....

(05/16-I)

5218

B. Sc. EXAMINATION

(Fourth Semester)

PHYSICS

Eighth Paper

Wave and Optics–II

Time : Three Hours *Maximum Marks :* 40

Note : There are *Nine* questions in this paper. Attempt *Five* questions in all. Q. No. **1** is compulsory. Attempt remaining four questions by selecting only *one* question from each Unit. Use of scientific (non-programmable) calculator is allowed. All questions carry equal marks.

1. (a) What are quarter and half wave plates ? 2

   (b) What is the importance of Fourier theorem ? 1

(c) Why can't we use two lenses (in contact) of the same material to form an achromatic doublet ? 1

(d) What do you mean by graded index fiber ? 2

(e) What is double refraction ? 1

(f) Explain the phenomenon of total internal reflection. 1

Unit I

2. Explain the following :

(a) Polarization, optic axis, positive and negative crystal, principle section and calcite crystal. 5

(b) Calculate the thickness of double refracting crystal to introduce a path difference of $\lambda/2$ between ordinary and extra-ordinary rays when $\lambda = 589.3$ nm, $\mu_0 = 1.5442$ and $\mu_e = 1.5533$. 3

3. (a) Describe various methods of producing and detecting plane polarized light. 6

(b) Calculate the specific rotation of the plane if polarization is turned through 30°, after traversing 25 cm length of 30% sugar solution. 2

Unit II

4. (a) State and explain Fourier theorem. What are its limitations ? 6

(b) Give the values of various Fourier series coefficients. 2

5. (a) State and prove Fourier integral theorem. 1,5

(b) What is Parseval's identify for Fourier integrals ? 2

Unit III

6. (a) Define and extract infinite and finite Fourier sine transforms. 6

(b) Fourier transforms are very useful to handle the various physics problems. Justify. 2

7. (a) Derive an expression for focal length of a thin lens separated by some distance apart. 6

(b) What are translational and refraction matrix ? 2

Unit IV

8. (a) What is distortion of images ? Discuss the types of distortion and how it is removed ? 6

(b) What are the causes of chromatic aberration ? 2

9. (a) What is acceptance angle ? Derive expression for numerical aperture in terms of fractional refractive index. 5

(b) The sum of refractive indices of core and cladding is 2.95 and their differences is 0.03. Calculate numerical aperture of the fiber. 3