

B.Sc.-II

Semester-IV

Physics-PH- 402

Paper VIII: Wave and Optics II

Max. Marks:40

Internal Assessment: 10

Time: 3 Hours

Note:

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (from all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit-1: Polarization

Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).

Unit-II: Fourier analysis

Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions, Fourier series of functions $f(x)$ between (i) 0 to 2π , (ii) $-\pi$ to π , (iii) 0 to π , (iv) $-L$ to L , complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of

triangular and rectangular waves , half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.

Unit III: Fourier transforms

Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions:

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

1 $|X| < a$

2 . $f(x) =$

0 $|X| > a$

Geometrical Optics I

Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.

Unit-IV: Geometrical Optics II

Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.

Fiber Optics

Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages.

References

1 Born M and Wolf E, Principles of Optics, Pergaman Press

2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New Delhi

3 Moller K D, Optics, University Science Books, Mill ally California

4 Tolansky, An Introduction to Interferometry, John Wiley & Sons, New Delhi

5 Shurcliff, Polarized Light Production and Use, Harward University Press, Cambridge,
M A (USA)

6 Arora C L, Refresher Course in Physics Vol II, S Chand and Co, New Delhi.