69. PHYSICS

Mechanics


3. Mechanics of rigid bodies: Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler’s equation, precession of a top. Gyroscope.

4. Central Forces: Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler’s laws, Coriolis force and its expressions.

5. Special theory of relativity: Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

Waves and Oscillations

1. Fundamentals of vibrations: Simple harmonic oscillator, and solution of the differential equation- Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus, compound pendulum, measurement of ‘g’, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.


3. Vibrating Strings: Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

4. Vibrations of bars: Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the mid point (iii) bar free at both ends (iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

Thermodynamics


OPTICS
1  Interference: Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light

Interference by division of wave front: Fresnel”s biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd”s mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton”s rings in reflected light with and without contact between lens and glass plate, Newton”s rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D1,D2 lines and thickness of a thin transparent plate.

2  Diffraction: Introduction – Distinction between Fresnel and Fraunhofer diffraction


3  Polarization: Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen”s explanation) – Quarter wave plate, Half wave plate – Babinet”s compensator – Optical activity, analysis of light by Laurent”s half shade polarimeter.


Electromagnetism, Electrostatics:

Electric Field:- Concept of electric field lines and electric flux, Gauss”s law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field E, irrotational field. Electric Potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of
charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

**Magnetostatics**

**Electromagnetic Induction**

**Electromagnetic waves**
Maxwell’s equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster’s angle, description of linear, circular and elliptical polarization.

**MODERN PHYSICS**

**Atomic Spectra and Models Inadequacy of classical physics:**