

69. PHYSICS

Part-A (40 Marks)

Electrostatics-Gauss's Law and its applications. Dielectrics and Capacitance. Magnetostatics. Moving charge in electric and magnetic fields-Hall effect, Cyclotron and Synchrocyclotron, Biot Savart's law. Electromagnetic induction-Faraday's laws and applications, Lenz law. Varying and alternating currents-LCR circuits and related concepts, Resonant circuits. Maxwell's equations and electromagnetic waves. Semiconductor devices-diodes, transistors, oscillators. Digital principles. Atomic and Molecular physics-atomic spectra, theories; Zeeman effect; X-ray spectra; Molecular spectra, Raman effect and spectroscopic techniques. Elements of quantum theory wave nature of matter, uncertainty principle, wave mechanics; Schrodinger's wave equation and its applications. Nuclear Physics-Nucleus, its properties and models; Radioactive decay-Laws and theories; Radiation detectors, Nuclear Reactors. Crystals structures and X-ray diffraction; bonding in crystals; Magnetic properties of materials; Superconductivity - Nano-materials.

Part-B (60 Marks)

Vector analysis-Vector integration, Stokes, Gauss and Greens theorems. Mechanics of particles-Laws of motion, conservation of energy and momentum, and collisions. Dynamics of a rigid body. Mechanics of continuous media- Elastic constants of isotropic solids and their relations. Dynamics of a rigid body. Mechanics of continuous media - Elastic constants of isotropic solids and their relation, Equation of continuity. Central forces-nature; Gravitational field; Kepler's laws. Special theory of relativity. Fundamentals of Vibrations- Simple harmonic oscillators. Damped and forced Oscillations. Complex Vibrations-Fourier theorem, analysis of periodic, square, triangular and saw tooth wave functions. Coupled Oscillators. Vibrating strings-transverse wave propagation, strings clamped at both the ends, overtones and energy transport. Vibrations of bars - longitudinal wave propagation in bars. Ultrasonic- properties, methods of production and detection, and applications. Kinetic theory of gases- Law of distribution of molecular speeds, Application to Viscosity, thermal conduction and diffusion of gases. Laws of thermodynamics, entropy and disorder. Thermodynamic potentials and Maxwell's equations, specific heats and Joule Kelvin effect. Low temperature Physics. Quantum theory of Radiation-Black body, Wein's law, Rayleigh Jeans law and Plank's law, and measurement of Radiation. Elements of Statistical Mechanics. Concept of ensembles - MB, BE and FD Statistics, Matrix Methods in paraxial optics. Aberrations and methods of their minimization. Interference and its theories; Interference by films and interferometry. Fraunhofer diffraction and Fresnel diffraction. Polarization-production and analysis. Phenomenon of double refraction. Babinet's compensator. Optical activity. Lasers, fibre optics and holography.