Engineering Physics

PART A

1. Elements of crystallography: Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes and directions, bonding in solids, origin of bands in solids (Qualitative idea), Metals, law in Crystals, Bragg's spectrometer.

2. Semiconductor materials: Intrinsic and extrinsic semiconductors, p-type, and n-type semiconductors; Fermi level in semiconductors; Current conduction in semiconductors, I-V characteristicsof p-n junction diode, Some special p-n diodes: Zener diode, Tunnel diode, Photo diode, and Light emitting diode.

3. Magnetic Materials & Superconductivity: Basic ideas of Dia, Para, Ferro & Ferrimagnetic materials, Ferrites, Hysteresis loop, Magnetic Anisotropy, Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations.

4. EM waves & Dielectrics: Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Dielectric polarization, Displacement current, Maxwell's Equations, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting vector, Electromagnetic Spectrum (Basic ideas of different region).

PART B

5. Quantum Theory: Need and origin of quantum concept, Wave - particle duality, Matter waves, Group & Phase velocities ; Wave function and Born interpretation; Uncertainty Principle ; Schrodinger wave equations (time independent & dependent); Application to particle in a box.

6. Lasers: Concepts of laser, Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Three & four level laser systems; Ruby, He -Ne, and semiconductor Lasers, Introduction to Holography.

7. Fibre Optics: Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse

broadening in optical fibres, fibre connectors, splices and couplers, Applications of optical fibres.

8. Nanomaterials: Nanoscale, Classifications of nanomaterials (3D, 2D, 1D and 0D)electron confinement, Nanocomposites, Carbon nanotubes (CNTs),

Properties of nanomaterials, synthesis of nanomaterials, ball milling and sol-gel techniques, Basic characterization techniques for nanomaterials, Applications of nanomaterials.