Code.229

Unit I: Mechanics – Relativity and Space Physics (15 Questions)

Impulse – Impact – Laws of Impact – Direct impact and Oblique impact between two smooth Spheres – Loss of Kinetic theory – Motion of two interacting bodies – Reduced mars – Rigid body dynamics
Relativity: Postulates of Special Theory of relativity – Lorentz transformation Equations and its Consequences – Relativity of Simultaneity - Mass Energy Equivalence
Space Physics: Escape Velocity – Orbital Velocity – Geo Stationary Orbits and Satellite Communication – Remote Sensing.

Unit II: Classical Mechanics (15 Questions)

Generalised Co-ordinates – D'Alembertz Principle - Lagrangian Equations and its applications – Hamilton's Equations from Variation Principle – Principle of Least Equation – Canonical Transformations and its applications – Hamilton – Jacobi Theory – Action Angle Variable – Kepler's Problem – Theory of Small Oscillations – Eulerian Angles, Eulerian Theorm – Coriolis force – Euler Equations of motion.

Unit III: Thermodnamics – Statistical Mechanics (20 Questions)

Laws of thermodynamics – Entropy – Thermodynamic potentials – Maxwell's equations and its applications Gibbs phase rule – Phase transition –Vanderwaal's equation of State.
Classical Statistics: Micro and Macro States – Liouville's theorm – Micro Canonical and grand Canonical ensembles – partition function Gibb's Paradox.
Quantum Statistics: Maxwell's distribution – BE Statistics – Black body radiation – planck's Radiation Law – FD Statistics – Applications

Unit IV: Optics – Atomic and Molecular Spectroscopy (25 Questions)

Basic ideas of Interference, Diffraction and Polarisation – Principle of LASER and its applications – Coupling Schemes – Zeeman effect – Paschen – Back effect – Spectra Structure of atomic molecules – Rotation, Vibration and Rotation – Vibration Spectra Frank – Condon principle – Microwave, IR, RAMAN, Mossbauer, NMR, NQR and ESR Spectroscopy – Principle, technique and applications.

Unit V: Solid State and Nuclear Physics (15 Questions)

Crystal Classes and Systems – 2D, 3D Lattices – Lattice heat capacity X- rays – X-ray diffraction – Uses – Band theory of Solids – Fermi level – Superconductivity – Basic concepts – application of Super Conductors. Different types of magnetic materials.
Nucleus – Properties and Structure – Nuclear forces – Binding energy – Radioactive decays – Particle detectors and accelerators – Nuclear fission and fusion – Elementary particles – Cosmic Rays

Unit VI: Quantum Mechanics (15 Questions)

Basic formalism – Schroedinger time dependent and time independent equations – eigen values and eigen functions – uncertainty principle – Hilbert space - Dirac notation – Schroedinger and Heisenberg interaction picture – WKB Quantisation rule – Time dependent perturbation theory – Fermi golden rule – Born and Sudden approximations – Dirac's relativistic equation – Dirac's equation for a central field – Sipin angular momentum – negative energy states.

Unit VII: Electro Magnetic Theory (20 Questions)

Gauss Law – Laplace and Poisson equations – Biot and Savart Law – Ampere Law – Faraday's Laws of induction – Maxwell's Equations – Molecular Polarisability and electrical susceptibility – Lorentz force – Equation of Continuity – Propagation of EM Waves in non conducting and conducting medium – relection and refraction at a plane interface between dielectrics – Radiation from a localised source – oscillating electric dipole.

Unit VIII: Electronic Devices and Applications (25 Questions)

Semi Conductor diode and Transistor – Optoelectronic devices – photo diode, photo transistor, LDR, LED, LCD, Special Semi conductor devices – JFET, MOSFET, UJT, SCR – Characteristics and applications – Operational amplifier Characteristics and applications – 555 timer – Block diagram and working.
Electrodes and transducers used in ECG and EEG techniques – ultrasound Scan – Basic ideas of CT and MRI Scan.

Unit IX: Digital Electronics and Microprocessor (25 Questions)

Logic gates – half and full adder and subtractors – Parellel binary adder – 8421 adder – karnaugh map –NAND – NOR networks – flipflops – counters and shift registers - Architecture of 8085 – Addressing models – Instruction set – Programming techniques – Semiconductor memory types – RAMS and ROMS – Interfacing of memory devices and I/o Ports.

Unit X: Communication Electronics (25 Questions)

Directional high frequency antennas – Sky wave propagation – Ground wave propagation – Modulation and demodulation techniques – Principle of radio communication – AM and FM transmission – RADAR Principle and equation – Television transmission and reception – Fibre optics – Propagation of Light in an Optical fibre – Losses and dispersion – applications.

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