

Syllabus for PAT Examination (Physics)

Unit-1

Complex variables, Analytical functions, calculus of residue, nature of singularities, evaluation of definite integral, Matrices- Linear transformation, Inverse, orthogonal and unitary matrices, Eigen values and eigen vectors

Unit-II

Approximation method – Stationary perturbation theory, non degenerate and degenerate cases, Variational method, Time dependent perturbation theory, Harmonic perturbation, Scattering theory- Scattering cross section, Partial wave analysis, and phase shift, First order Born approximation with their applications.

Unit-III

Differential amplifier- CMRR, Operational amplifier, Characteristics of Op-Amp, Inverting and non inverting amplifier, Adder, subtractor, Differentiator, integrator, Current to voltage convertor, First order active filters, Oscillators- Principle Barkhausen criterion, Phase shift oscillator

Unit- IV

Band theory- Bloch theorem, K. P. Model, Distinction between conductor, insulator and semiconductor, Classification of magnetic materials, Molecular field theory, quantum theory of dia, para and ferro magnetism.

Unit-V

Atomic spectra- spin orbit interaction, Fine structure of hydrogen lines, LS and JJ coupling, Zeeman and Paschen back effect of one and two valence electron system, Molecular spectra- Franck-Condon Principle, rotational, rotational vibrational and electronic spectra of diatomic molecules. Laser- Basic principle of lasers, He-Ne and Co₂ Laser

Unit -VI

Classical electrodynamics- Lorentz transformation as orthogonal transformation, Invariance of Maxwell equations under Lorentz transformation,

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Unit-VII

Plasma- Motion of charged particle in uniform electric and magnetic fields, Pinch effect and plasma confinement, Alfvén wave and magnetosonic wave, Appleton-Hartree formula and propagation of electromagnetic wave through ionosphere.

Unit—VIII

Quantum mechanical ensembles, density matrix, Liouville's theorem, Partition function, free particle in a box, Ideal Fermi gas, ideal Bose gas and their properties

Unit- IX

Nucleon-nucleon scattering, partial wave analysis, direct and compound nuclear reaction mechanism, Compound nucleus. Fermi theory of β -decay, Liquid drop model shell model, magic number

Unit -X

Computer arithmetic, Methods of finding roots of equation, Newton-Raphson method, Newton interpolation, least square fitting of a function, Trapezoidal rules, Simpson rule for numerical integration, Fortran and C programme for the above methods.

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