

# Syllabus for MS and PhD Entrance Test

## Basic Mathematics

- **Set theory** : Venn diagram, set operations, mathematical induction, functions and relations
- **Algebra and linear algebra** : Theory of equations, complex numbers, matrices and determinants
- **Real and complex analysis** : Basics of limit, continuity, differentiation, integration, elementary differential equations, series and sequences and their convergence, Analytic functions, Cauchy-Riemann equations, complex integration, Cauchy's theorem and formula, power series and their convergence, Taylor and Laurent series, beta and gamma functions, Laplace and Fourier transforms
- **Combinatorics** : Sum and product rules, permutation, combination, recurrence relations, pigeon-hole principle, principle of inclusion and exclusion
- **Probability and statistics** : Mean, median, mode, basic notion of probability, expectation, variance and standard deviation, discrete and continuous probability distributions, binomial, Poisson and normal distributions, conditional probability and Bayes theorem

**Weight: 40%**

## Digital Logic

- **Switching theory** : Boolean algebra, logic gates, and switching functions, truth tables and switching expressions, minimization of switching functions, Karnaugh map
- **Combinational logic circuits**: Realization of Boolean functions using gates and multiplexers
- **Sequential m/c model** : Flip-flops, basic design of counters

**Weight: 30%**

## Basics of Programming

The student should be familiar with the basic concepts of programming and should be able to write programs involving the following concepts in any one of the following languages: C, C++ or Java.

- Conditional constructs, iteration (loops), function or method call, recursion, recursive decomposition of a problem.
- Basic notions of space and time complexity
- Parameter passing mechanism, scope, binding
- Arrays, lists, stacks, queues, binary tree, binary search tree
- Basics of searching and sorting
- Graph and its representation

**Weight: 30%**

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