

**School of Information Technology
IIT Kharagpur**

Syllabus for PhD and MS Admission Test

Part A: Basic Mathematics

(40 Marks)

Sets, Relations and Functions

Basic definitions in set theory, Venn diagram, Operations on sets, Functions; Binary relations, Total order and partial order, Lattice; Principle of mathematical induction.

Matrix and linear algebra

Matrices and determinant, Rank, Singularity, Eigen vector and Eigen value; Linear equations and Homogeneous system of linear equations, Vector distance measures: Manhattan and Euclidean, Dot and cross product of vectors.

Combinatorics

Permutation and combination, Recurrence relations, Sum and product rules, Principle of inclusion and exclusion, Pigeon-hole principle

Probability and statistics

Basic notion of probability, Expectation, Discrete and continuous distributions: Binomial distribution and Bernoulli trials, Poisson distribution, Exponential distribution and Normal distribution; Probability distribution function and probability density function; Conditional probability and Bayes' theorem; Mean, median, mode, variance and standard deviation.

Part B: Basic of Programming

(40 Marks)

Programming in C: Storage types, decision and control structures, pointer, parameter passing, recursion, structures, file handling, and system call in C.

Data Structures: Linked list, stack, queue, binary trees (binary search tree, heap tree), hash table, B+ tree

Algorithms: Sorting algorithms: insertion sort, selection sort, quick sort, heap sort, merge sort; searching algorithms: sequential search, binary search, Fibonacci search, interpolation search; problem solving with greedy, dynamic programming and divide-and-conquer strategies; finding shortest paths in graphs, minimum spanning tree, graph traversals

Part C: Logical Reasoning and Aptitude
(20 Marks)

Logical Reasoning: Number Series, Letter and Symbol Series, Analogies, Matching, Making Judgments, Logical Problems, Logical Games, Analyzing Arguments, Statement and Conclusion, Cause and Effect, Logical Deduction.

Verbal Reasoning: Logical Sequence of Words, Blood Relation Test, Series Completion, Cause and Effect, Reasoning with Venn Diagrams, Analogy, Direction Sense Test, Classification, Verification of Truth.

Non Verbal Reasoning: Series, Analytical Reasoning, Mirror Images, Pattern Completion, Paper Folding, Rule Detection, Shape Construction, Image Analysis.

Arithmetic Aptitude: Profit and Loss, Ratio and Proportion, Simple and Compound Interest, Time and Work, Volume and Surface Area, Charts (Line, Bar, Pie).