

Chennai Mathematical Institute  
MSc/PhD Computer Science

**Topics covered in entrance examination**

- Discrete Mathematics

Sets and relations, elementary counting techniques, pigeon hole principle, partial orders,

- Elementary probability theory

- Automata Theory

Regular expressions, non deterministic and deterministic finite automata, subset construction, regular languages, non regularity (pumping lemma), context free grammars, basic ideas about computable and noncomputable functions.

- Algorithms

O notation, recurrence relations, time complexity of algorithms, sorting and searching (bubble sort, quick sort, merge sort, heap sort).

- Data structures

Lists, queues, stacks, binary search trees, heaps.

- Graphs

Basic definitions, trees, bipartite graphs, matchings in bipartite graphs, breadth first search, depth first search, minimum spanning trees, shortest paths.

- Algorithmic techniques

Dynamic programming, divide and conquer, greedy.

- Logic

Boolean logic, truth tables, boolean circuits — and, or, not, and, nand gates.

**Suggested reading material**

1. Frank Harary: *Graph Theory*, Narosa.
2. John Hopcroft and Jeffrey D Ullman: *Introduction to Automata, Languages and Computation*, Narosa.
3. Jon Kleinberg and Eva Tardos: *Algorithm Design*, Pearson.
4. C. Liu: *Elements of Discrete Mathematics*, Tata McGraw-Hill.