Syllabus for Computer Science Master's

Section 1: Subject Knowledge

Please Note: A Total of 40 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: Engineering Mathematics

Discrete Mathematics, Graphs, Combinatorics, Linear Algebra, Calculus, Probability and Statistics.

Unit II: Digital Logic

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Unit III: Computer Organization and Architecture

Machine instructions and addressing modes. ALU, data path and control unit. Instruction pipelining, pipeline hazards. Memory hierarchy, cache, main memory and secondary storage, I/O interface (interrupt and DMA mode).

Unit IV: Programming and Data Structures Programming in C

Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Unit V: Algorithms

Searching, sorting, hashing. Asymptotic worst-case time and space complexity. Algorithm design techniques, greedy, dynamic programming, and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths.

Unit VI: Theory of Computation

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.

Unit VII: Compiler Design

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimization, Data flow analyses, constant propagation, liveness analysis, common sub-expression elimination.

Unit VIII: Operating System

System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.

Unit IX: Databases

ER-model. Relational model, relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Unit X: Computer Networks

layers (OSI, TCP/IP), packet switching, data link (framing, error detection, MAC), routing (protocols, algorithms), IP (addressing, fragmentation, protocols), transport (flow control, congestion control, UDP, TCP), and application layer protocols.

Section 2: Fundamental Skills

Please Note: A Total of 24 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: Data Analysis

Unit II: Math and Statistics

Unit III: Lab Skills

Unit IV: Reading and Writing

Section 3: Specific Skill Proficiency

This section has multiple skills. You can select the ones you are proficient in from the enrollment form. You can select a maximum of 4 skills