

### Unit - 1: Discrete Structures

Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Monoids, Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

### Unit - 2: Digital Logic

Boolean algebra, Logic Gates, Combinational and sequential circuits, Minimization, Number representations and computer arithmetic (fixed and floating point), Computer Arithmetic - Addition, Subtraction, Multiplication and Division Algorithms.

### Unit - 3: Computer System Architecture

Register Transfer and Microoperations, Basic Computer Organization and Design, 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 - 4: Programming and Data Structures

Object Oriented Programming, Programming in C++, Recursion, Arrays and their Applications; Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists, Trees, Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B\* Tree, Red Black Tree, Binary heaps, Graphs

### Unit - 5: Algorithms

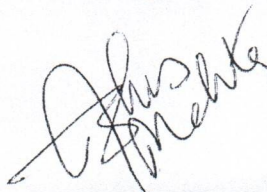
Searching, sorting, hashing. Asymptotic worst-case time and space complexity. Algorithm design techniques: Divide and Conquer, Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound. Graph traversals, Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees. P and NP Class Problems; NP-completeness and Reducibility.

### Unit - 6: 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. Models of Computation and Church-Turing Thesis; Recursive and Recursively-Enumerable Languages; Context-Sensitive Languages; Unrestricted Grammars, Chomsky Hierarchy of Languages

### Unit - 9: Compiler Design

Lexical analysis, Syntax Analysis, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimisation, Code Generation and Code Optimization, Data flow analyses: constant propagation, liveness analysis, common subexpression elimination.



### Unit - 8: System Software and Operating System

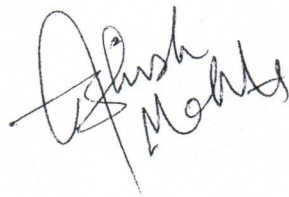
System Software, System calls, Process Management, threads, inter-process communication, concurrency and synchronization, Deadlock, CPU and I/O scheduling, Memory management and virtual memory, Storage Management, File and Input/Output Systems

### Unit - 9: Database Management Systems

Database System Concepts and Architecture, 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 - 10: Data Communication and Computer Networks

Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP),

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