

## **Code: CS                      Computer Science and Information Technology**

### **Engineering Mathematics**

**Discrete Mathematics:** Propositional and First Order Logic, Sets, Relations, Functions, Partial Orders and Lattices, Groups. Graphs: Connectivity, Matching, Coloring. Combinatorics: Counting, Recurrence Relations, Generating Functions.

**Linear Algebra:** Matrices, Determinants, System of Linear Equations, Eigen values and Eigen vectors, LU Decomposition.

**Calculus:** Limits, Continuity and Differentiability, Maxima and Minima, Mean Value Theorem, Integration.

**Probability:** Random Variables: Uniform, Normal, Exponential, Poisson and Binomial Distributions. Mean, Median, Mode and Standard Deviation. Conditional Probability and Bayes Theorem.

### **Computer Science and Information Technology**

**Digital Logic:** Boolean Algebra, Combinational and Sequential Circuits: Minimization, Number Representations and Computer Arithmetic (Fixed and Floating Point Representations).

**Computer Organization and Architecture:** Machine Instructions and Addressing Modes, ALU, Data-Path and Control Unit, Instruction Pipelining, Memory Hierarchy: Cache, Main Memory and Secondary Storage; I/O Interface (Interrupt and DMA Mode).

**Programming and Data Structures:** Programming in C, Recursion, Arrays, Stacks, Queues, Linked Lists, Trees: Binary Trees, Binary Search Trees, Tree Operations, Binary Heaps, Graph terminology and representation, Graph traversal techniques.

**Algorithms:** Searching, Sorting, Hashing, Asymptotic Notations, Time and Space Complexity. Algorithm Design Techniques: Greedy, Dynamic Programming and Divide-and-Conquer. Graph traversal techniques, Minimum Spanning Trees, Shortest Path algorithms.

**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.

**Compiler Design:** Lexical Analysis, Parsing, Syntax-Directed Translation, Runtime Environments, Intermediate Code Generation.

**Operating System:** Processes, Threads, CPU Scheduling, Inter-Process Communication, Concurrency and Synchronization, Deadlock, Memory Management and Virtual Memory, File Systems.

**Databases:** ER-Model, Relational Model: Relational Algebra, Tuple Calculus, SQL, Integrity Constraints, Normal Forms, File Organization: Indexing, B Trees and B+ Trees, Transactions and Concurrency Control.

**Computer Networks:** Concept of Layering, LAN Technologies (Ethernet), Flow and Error Control Techniques, Switching, Ipv4/Ipv6, Routers and Routing Algorithms (Distance Vector, Link State). TCP/UDP and Sockets, Congestion Control. Application Layer Protocols: DNS, SMTP, POP, FTP, HTTP. Basics of Wi-Fi, Network Security: Authentication, Basics of Public Key and Private Key Cryptography, Digital Signatures and Certificates, Firewalls.

**Software Engineering:** Software Process Models, Data Flow Diagram, UML Diagrams, Life Cycle, Design, Coding, Testing, Implementation, Maintenance.

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