

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

### **a) 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.

### **b) Computer Science and Information Technology**

**Digital Logic:** Boolean algebra: Logic Gates, Number Representations, Combinational and Sequential Circuits, Flip- Flops & Counters: Minimization, and Computer Arithmetic (Fixed and Floating Point Representations).

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

**Programming and Data Structures:** Programming in C, functions, Parameter Passing, Recursion, Structured Data Types: arrays, structure, union, strings, pointers, file handling.

Arrays, Stacks, Queues, Linked Lists, Trees: Binary Trees, Tree Traversal techniques, Binary Search Trees, Tree Operations, Heaps, Graph terminology and representation.

**Algorithms:** Searching, Sorting, Hashing, Asymptotic Notations, Time and Space Complexity. Algorithm Design Techniques: Greedy, Dynamic Programming and Divide-and-Conquer. Graph traversal techniques, 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, Basics of code optimization, Local optimization, Common Sub expression elimination.

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

**Databases:** ER-Diagrams, 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, Flow and Error Control Techniques, Switching, IPv4/IPv6, Routers and Routing Algorithms (Shortest path, flooding, Distance Vector, Link State). TCP/UDP and Sockets, Congestion Control. Application Layer Protocols: DNS, SMTP, POP, FTP, HTTP, Email. 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, Requirements engineering, Design, Software Testing and Maintenance.

**Web Technologies:** XML-Documents and Vocabularies-Versions and Declaration -Namespaces JavaScript and XML: Ajax-DOM based XML processing, Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations, XSLT-Displaying XML Documents in Browsers.

Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications.

Web Services: JAX-RPC-Concepts-Writing a Java Web Service Client, Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies

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