

Data Structures and Algorithms: Asymptotic worst-case time and space complexity, Recursion, Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs. Divide and Conquer: General method, Binary search, Maximum and Minimum, Merge sort, Quick sort, Selection sort, Strassen's Matrix multiplication, Greedy: General method, Knapsack problem, Job sequencing with deadlines, MST, Optimal storage on tapes, Optimal merge pattern, Single source shortest path. Dynamic Programming: General method, Multistage graph, All Pair Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Backtracking: General method, 8-Queens problem, Sum of Subsets, Graph Coloring, NP-hard and NP-complete problems.

Operating System: Processes, threads, inter-process communication, concurrency, and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems. Database: 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.

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).

Database Management System: Relational Database Design, E-R and E-E-R Model, Architecture, Relational model, Relational Algebra, Relational Calculus, Relational design, Normalization, 1NF, 2NF, 3NF, BCNF and 4NF.

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

Computer Architecture and Organization: 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).

Microprocessor & Microcontroller: 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing, Schematic and Pin diagrams, Pin functions, Bus Organization, Programming model of 8051, Addressing modes, Internal operations and registers, externally initiated operations, Serial interrupt and I/O Control, Timing and Control Unit, multiplexing of address/data bus, Generation of control signals, 8085 machine cycles.

Signals & Systems: Sampling theorem and its applications, Interpolation of discrete-time signals, LTI systems and properties, causality, Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Fourier series and Fourier transform representations, Z-transform, impulse response, convolution, poles and zeros, stability analysis, digital filter design techniques, frequency response.

Analog & Digital Communication: Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, circuits for analog communications, superheterodyne receivers, Information theory: entropy, mutual information, and channel

capacity theorem; Digital communications: PCM, ASK, PSK, FSK, QAM, matched filter receiver, Fundamentals of error correction, Basics of TDMA, FDMA and CDMA.

Telecommunication Engineering: Cellular Infrastructure, Cellular System Components, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization, Free Space Propagation Model, Theory of Vcoders, Types of Vcoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties, Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms, Introduction to 4G and concept of NGN.

Wireless Sensor Network: Introduction to sensor networks: Key definitions of sensor networks, sensor network architecture, unique constraints and challenges, advantages of sensor network, driving applications, issues in design of sensor network, data dissemination and gathering, MAC protocols for sensor network, location discovery.

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