TAKSHASHILA UNIVERSITY

(Established under Tamil Nadu Private Universities Act, 2019 &
Recognised by UGC u/s 2(f) of the UGC Act, 1956)
ONGUR, TINDIVANAM TK, VILLUPURAM DT

FACULTY OF ENGINEERING AND TECHNOLOGY

Ph.D. Entrance Examination Syllabus

Department of Computer Science and Engineering

I. Data Structures

Abstract Data Types (ADTs) – List ADT-Stack ADT – Operations – Applications-Tree ADT – Tree Traversals – Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees-Graph Definition – Representation of Graphs – Types of graph – Breadth-first traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's Algorithm-Searching-Sorting-Hashing.

II. Design and Analysis of Algorithms

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. – Mathematical analysis for Recursive and Non-Recursive Algorithms-Brute Force and Divide-And-Conquer-String Matching – Closest-Pair and Convex-Hull Problems -Exhaustive Search – Travelling Salesman Problem – Knapsack Problem – Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort.

III. Operating Systems

Operating System Structures - Simple Batch – Multi-programmed - Parallel - Distributed Systems - Real-Time Systems - System components - Process and CPU Scheduling - Process concepts and scheduling - Memory Management and Virtual Memory - Logical versus Physical Address Space – Swapping - Contiguous Allocation – Paging – Segmentation - Segmentation with Paging - Demand Paging - Page Replacement - Page Replacement Algorithms - File System Interface and Operations - Access methods - Directory Structure – Protection - File System Structure - Allocation methods - Free-space.

IV. Software Engineering Concepts

Introduction to Software Engineering: Process models: Software Requirements: Functional and non-functional requirements - user requirements - system requirements - Requirements engineering process: Feasibility studies - requirements elicitation and analysis - requirements validation - requirements management. conceptual model of UML - basic structural modeling - class diagrams - sequence diagrams - collaboration diagrams - use case diagrams - component diagrams - Testing Strategies: Metrics for Process and Products: Software measurement - metrics for software Quality - Risk management.

V. Database Design

Entity-Relationship model – E-R Diagrams – Enhanced - ER Model – ER-to-Relational Mapping – Functional Dependencies – Normal forms - ACID Properties -Concurrency Control - Deadlock Handling - RAID – File Organization - Distributed Databases - Database Security: Security issues – Access control based on privileges – Role Based access control.

Reference Books

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition, Pearson. 2024.
2. Michael T. Goodrich, Roberto Tamassia & Michael H. Goldwasser, Data Structures and Algorithms in Java, 6th Edition, Wiley, 2021.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 4th Edition, MIT Press, 2022.
4. Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, 5th Edition, Pearson,

2023.
5. Roger S. Pressman and Bruce R. Maxim, Software Engineering: A Practitioner's Approach, 9th Edition, McGraw-Hill, 2023.
6. Ian Sommerville, Software Engineering, 10th Edition, Pearson, 2016.
7. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill, 2020.
8. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

Department of Electronics and Communication Engineering

I. Electronic Devices

Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, photo diode and solar cell. Basics of LASERs. Applications of diodes: HWR, FWR, clipper, clamper.

II. Analog and Digital Circuits

Analog Circuits: BJT and CMOS circuits and amplifiers, Inverting and non-inverting operational amplifiers, Differential amplifiers, practical opamp parameters, open-loop and closed-loop frequency response, gain-bandwidth product, slew rate, CMRR. Adder, integrators, differentiators, voltage comparators, Schmitt trigger, peak detector, class A, B, C and AB power amplifiers.

Digital Circuits: Number Systems, Boolean Algebra- Karnaugh Map –Minimization of sum of products, product of Sums forms, Combinational Circuits: Multiplexers, Demultiplexers, Decoders, Encoders and Code Converters. Sequential circuits: Latches, Flip flops, Registers and Counters, Semiconductor memories: ROM, SRAM, DRAM. Microcontroller (8051): architecture, programming, memory and I/O interfacing.

III. Digital Signal Processing

Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method, Bilinear transformation method.

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Barlet and Kaiser windows.

IV. Electromagnetics

Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters,

pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

V. Communication Engineering

Analog communications: Analog modulation schemes – AM, FM, PM, spectrum analysis, superheterodyne receivers, Random process and Noise.

Digital communications: sampling – quantization – encoding – aliasing – Nyquist rate - Modulation schemes PAM, PCM, PSK, FSK, QAM and higher order of modulation techniques and their error performance – pulse shaping, matched filter.

Reference Books

1. Principles of Electronic Devices & Circuits -BL Theraja | RS Sedha – 2007.
2. Electronic Devices and Circuits | 5th Edition - S Salivahanan, N Suresh Kumar.
3. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2018, Fifth Edition.
4. Digital Fundamentals by Morris and Mano, PHI Publication.
5. Ramesh Gaonkar, 'Microprocessor Architecture, Programming & application with 8085', Fifth Edition, Penram Publications.
6. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
7. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 2002.
8. M.N.O.Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford(Asian Edition), 2015.
10. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
11. Communication Systems- Simon Haykin, 2nd Edition, Wiley Publications.
12. Digital communications - Simon Haykin, John Wiley, 2005.
13. Digital and Analog Communication Systems – K.Sam Shanmugam, John Wiley,2005.