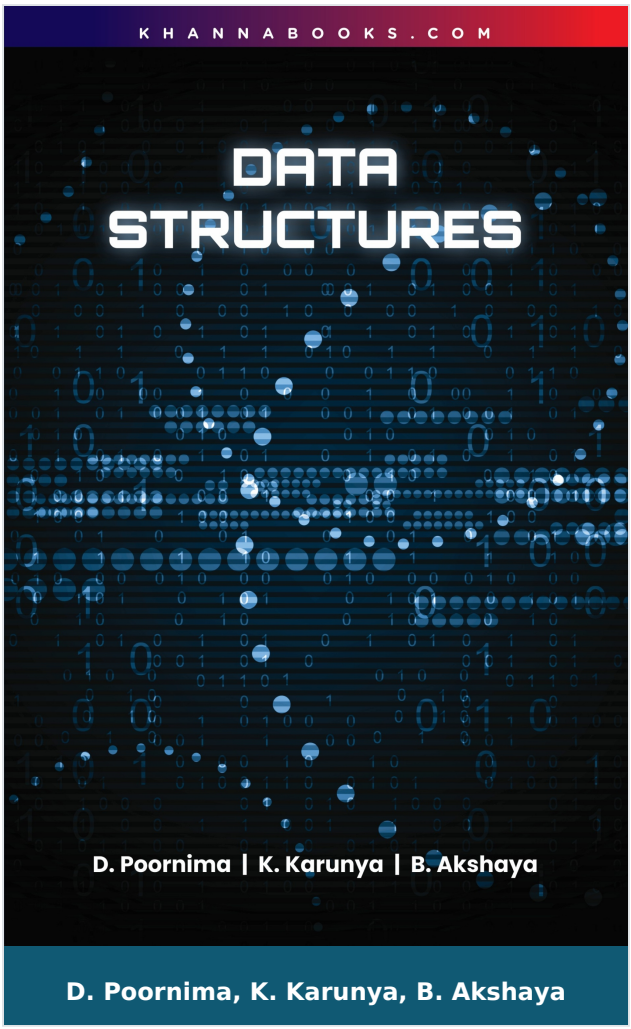


Data Structures

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Product Description

This comprehensive textbook offers an indispensable foundation in data structures, the core discipline for efficient computing and algorithm design. It is explicitly designed to empower students, software developers, and computer science professionals with the ability to organize, manage, and process data optimally, thereby reducing computational overhead and enhancing application performance.

The book systematically guides readers through fundamental concepts, beginning with linear structures like Arrays, Linked Lists, Stacks, and Queues, and progresses to complex, non-linear structures such as Trees and Graphs. A strong emphasis is placed on the dual goals of reducing time complexity and optimizing memory storage, which are vital for developing modern, scalable software. Readers will gain practical proficiency through units dedicated to Search and Sorting Techniques and critical graph algorithms like Dijkstra's and Minimum Spanning Trees. By blending academic rigor with extensive real-world Case Studies and practical programming examples in C, this text ensures that learners not only understand how these structures work, but also why they are the backbone of modern applications in areas like databases, AI, and network optimization.

Salient Features:

• Fundamental Concepts: Provides a clear introduction to data structures, covering classifications (linear vs. non-linear) and the core need for optimizing both time and space complexity.

• Advanced Structures: Thoroughly covers complex, non-linear structures like Binary Trees, BSTs (Binary Search Trees), and even AVL Trees, detailing their implementation and use in storage and retrieval.

• Graph Theory: Explores Graphs with depth, covering representation using Adjacency Matrix and List, and essential traversals like Breadth-First Search (BFS) and Depth-First

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Search (DFS).

• Pathfinding Algorithms: Dedicated focus on practical solutions with algorithms for Minimum Spanning Trees (Kruskal's/Prim's) and Shortest Paths (Dijkstra's, Bellman-Ford, Floyd-Warshall).

• Algorithm Analysis: Offers a comprehensive unit on Search and Sorting Techniques (Quick Sort, Merge Sort, Heap Sort), with detailed analysis comparing the efficiency of various algorithms.

• Practical Coding: Includes numerous Solved Problems and C programming code examples for all major operations (insertion, deletion, traversal), enabling hands-on implementation skills.

• Real-World Applications: Features focused Case Studies throughout, illustrating how structures like Queues and Trees are utilized in practical scenarios such as hospital queue optimization and network routing.

• ICT Integration: Recommends specific digital tools, including online visualizers (like VisuAlgo) and competitive programming platforms (like LeetCode), to enhance interactive and application-based learning.

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