Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2021 and later)

PROGRAMME AND BRANCH: B.Sc., INFORMATION TECHNOLOGY

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	CORE ELECTIVE	U21IT3E1A	DATA STRUCTURE

Date & Session:25.04.2025/FN **Time : 3 Hours** **Maximum 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	Which term refers to the step-by-step procedure to solve a problem? a) Data Abstraction b) Algorithm c) Sparse Matrix d) Polynomial
CO1	K2	2.	Data abstraction in data structures primarily focuses on: a) Hiding implementation details b) Increasing time complexity c) Storing data in arrays d) Optimizing memory usage
CO2	K1	3.	The principle used in stacks is: a) FIFO b) LIFO c) Round Robin d) Priority
CO2	K2	4.	Postfix notation "AB+C*" evaluates to: a) (A + B) * C b) A + (B * C) c) A * B + C d) C * (A + B)
CO3	K1	5.	A binary tree with all leaf nodes at the same level is called: a) Complete Binary Tree b) Full Binary Tree c) Perfect Binary Tree d) Balanced Binary Tree
CO3	K2	6.	In-order traversal of a binary search tree produces: a) Random order b) Descending order c) Ascending order d) Reverse order
CO4	K1	7.	Which algorithm is used to find the minimum spanning tree? a) Dijkstra's b) Kruskal's c) BFS d) DFS
CO4	K2	8.	The time complexity of Prim's algorithm for a graph with (V) vertices is: a) (O(V^2)) b) (O(V \log V)) c) (O(E \log V)) d) (O(E + V))
CO5	K1	9.	Which sorting algorithm uses a "divide and conquer" strategy? a) Insertion Sort b) Quick Sort c) Bubble Sort d) Selection Sort
CO5	K2	10.	Static hashing is ideal for: a) Dynamic datasets b) Fixed-size datasets c) Sparse matrices d) Graphs
Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – B (5 X 5 = 25 Marks) Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Explain performance analysis (time and space complexity) with an example.
			(OR)
CO1	K3	11b.	How are sparse matrices represented in memory? Provide a code snippet.
CO2	K3	12a.	Implement a stack using arrays and write functions for push() and pop().
			(OR)
CO2	K3	12b.	Explain how a singly linked list can be used to represent polynomials.

CO3	K4	13a.	Write the steps for post-order traversal of a binary tree and provide an example. **(OR)**
CO3	K4	13b.	How is a heap structured? Demonstrate inserting an element into a max-heap.
CO4	K4	14a.	Describe Kruskal's algorithm for finding the minimum spanning tree with an example. **(OR)**
CO4	K4	14b.	Explain how Dijkstra's algorithm finds the shortest path in a graph.
CO5	K3	15a.	Trace the steps of merge sort on the array: [38, 27, 43, 3, 9, 82, 10]. **(OR)**
CO5	K3	15b.	How does heap sort work? Compare its time complexity with quick sort.

Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Analyze the differences between arrays and linked lists in terms of memory allocation and time complexity for insertion/deletion. **(OR)**
CO1	K3	16b.	Evaluate the time complexity of an algorithm for sparse matrix multiplication. Provide a step-by-step analysis.
CO2	K4	17a.	Design a linked list-based queue and write functions for enqueue() and dequeue(). Explain its advantages over array-based queues. **(OR)**
CO2	K4	17b.	Compare singly linked lists and doubly linked lists for representing polynomials. Which is more efficient for sparse polynomial addition?
CO3	K4	18a.	Critique the heapify process in a max-heap. Demonstrate with an example and discuss its time complexity. **(OR)**
CO3	K4	18b.	Analyze the steps to convert a forest into a binary tree. Illustrate with a diagram and explain its applications.
CO4	K5	19a.	Compare Kruskal's and Prim's algorithms for minimum spanning trees. Which is better suited for sparse graphs? Justify. **(OR)**
CO4	K5	19b.	Evaluate the Floyd-Warshall algorithm for all-pairs shortest paths. Trace its steps on a sample graph with 4 nodes.
CO5	K5	20a.	Design a quick sort algorithm and demonstrate its execution on the array [10, 7, 8, 9, 1, 5]. Discuss its worst-case scenario. **(OR)**
CO5	K5	20b.	Critique static hashing vs. dynamic hashing. When would you prefer a hash table over a binary search tree?