Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd..u/s 3of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore-641043, Tamil Nadu, India

Bachelor's Degree Examination - November 2025
III Semester

Class : II UG **Time : 3 Hours**
Major : Computer Science **Max. Marks : 100**

23BCSC06 Algorithms

Course Outcomes:

CO1: Design and analyze programming problem statements
CO2: Deploy sorting and search algorithms and analyze their computational complexities
CO3: Implement standard operations on graph data structures
CO4: Analyze the time and space complexities
CO5: To analyze Randomized, Distributed, Heuristics algorithms

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Which of the following is not a characteristic of the Divide and Conquer technique? CO1K1
   a. Breaking the problem into smaller subproblems
   b. Solving each subproblem independently
   c. Combining the results of subproblems
   d. Reducing the time complexity to O(1)

2. If we use a greedy algorithm for the fractional knapsack problem, the solution is_____. CO1K1
   a. Always optimal
   b. Sometimes optimal, sometimes not
   c. Never optimal
   d. Same as dynamic programming

3. Which of the following sorting algorithms has the best average-case time complexity? CO2K1
   a. Bubble Sort b. Insertion Sort
   c. Merge Sort d. Linear Search

4. Which searching technique is most efficient for sorted arrays? CO2K1
   a. Linear Search b. Binary Search
   c. Heap Search d. Counting Search

5. Which of the following data structures is best suited for implementing Breadth - First Search (BFS)? CO3K1
   a. Stack b. Queue
   c. Priority Queue d. list

6. Which of the following algorithms is not used to find a Minimum Spanning Tree (MST)? CO3K1
   a. Kruskal's Algorithm b. Prim's Algorithm
   c. Dijkstra's Algorithm d. Borůvka's Algorithm

7. If an algorithm has a time complexity of $T(n) = 5n^2 + 3n + 10$, the Big-O notation is? CO4K1
   a. $O(n^3)$ b. $O(n^2)$
   c. $O(n \log n)$ d. $O(n)$

8. Which of the following correctly represents the tight bound of an algorithm? CO4K1
   a. $O(n)$ b. $\Omega(n)$
   c. $\Theta(n)$ d. $o(n)$

9. Which of the following algorithms uses randomization to improve performance? CO5K1
   a. Deterministic Quick Sort b. Randomized Quick Sort
   c. Breadth-First Search (BFS) d. Dijkstra's Algorithm

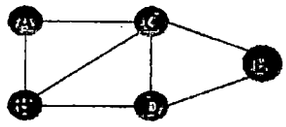
10. Which of the following is not a typical property of a distributed algorithm? CO5K1
    a. Concurrency
    b. Coordination among multiple processes

Part B — 5 x 6 = 30

Answer ALL questions

Each answer should not exceed 400 words or two pages

11.a.	Explain how iterative algorithm design techniques differ from recursive approaches.	CO1K2
	(or)	
11.b.	Compare the Divide and Conquer technique with Dynamic Programming	CO1K2
12.a.	Compare Bubble Sort, Insertion Sort, and Merge Sort.	CO2K
	(or)	
12.b.	Given an array A = [25, 10, 15, 30, 5]. Perform one full iteration of Bubble Sort and show the intermediate steps.	CO2K2
13.a.	List the applications of graph and discuss about them in detail.	CO3K2
	(or)	
13.b.	Elaborate on Depth First Search Algorithm for the following graph.	CO3K3



14.a.	Explain the different asymptotic notations used in algorithm analysis.	CO4K2
	(or)	
14.b.	Compare and contrast best case, worst case and average case complexities.	CO4K3
15.a.	Discuss two key challenges in designing distributed algorithms.	CO5K2
	(or)	
15.b.	Explain binary search with an example.	CO5K3

Part C — 5 x 12 = 60

Answer ALL questions

Each answer should not exceed 800 words or four pages

16.a.	Discuss in detail the various algorithm design techniques with suitable examples.	CO1K2
	(or)	
16.b.	Give an overview dynamic programming and greedy algorithms.	CO1K4
17.a.	Explain the working of Quick Sort and trace the algorithm step by step for the input [40, 20, 10, 80, 60, 30] assuming the last element as pivot.	CO2K2
	(or)	
17.b.	Explain the working of the Heap Sort algorithm	CO2K2
18.a.	Design and explain Kruskal's Algorithm to find the Minimum Spanning Tree (MST)	CO3K5
	(or)	
18.b.	Discuss string processing algorithms with suitable examples.	CO3K5
19.a.	Analyze and discuss NP-hard and NP-complete problems in detail.	CO4K5
	(or)	
19.b.	Design an algorithm and analyze its time complexity step by step.	CO4K4
20.a.	Demonstrate the different heuristic search techniques in detail.	CO5K3
	(or)	
20.b.	Discuss the role and applications of randomized algorithms and heuristic search techniques in solving NP-hard problems.	CO5K5

****