2025 MAY

MCS201 ADVANCED ALGORITHM

Full Marks: 100 Time: Three Hours

Answer **any FIVE** questions

Q. 1	a	Explain the working of the Quick Sort algorithm with an example. Analyze its average and worst-case time complexity.	10
	b	Compare Bubble Sort, Insertion Sort, and Merge Sort in terms of their time complexities and practical use cases.	10
Q. 2	a	What is a Topological Sort? Describe the algorithm using DFS and explain its applications with an example.	10
	b	Describe Dijkstra's Algorithm for finding the shortest path in a graph with non-negative edge weights.	10
Q. 3	a	Explain the Strongly Connected Components (SCC) algorithm using DFS.	10
	b	What is amortized analysis? Explain with an example.	10
Q. 4	a	Differentiate between asymptotic and amortized analysis. Use an appropriate table or diagram for clarity.	10
	b	What is a matroid? Define it and explain using an example.	10
Q. 5	a	How does the greedy algorithm work in the context of matroids? Illustrate with a problem.	10
	b	What is an augmenting path in a matching? Explain Berge's Lemma and how it helps in identifying maximum matchings.	10
Q. 6	a	Describe the Ford-Fulkerson algorithm for computing maximum flow in a network. Provide a diagram and step-by-step explanation of the residual network.	10
	b	Explain Strassen's algorithm for matrix multiplication.	10

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