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CBCS SCHEME

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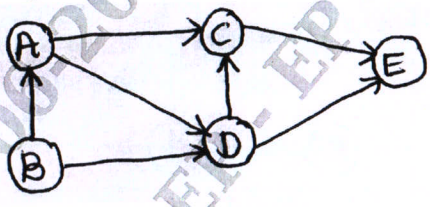
BCS401

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026
Analysis & Design of Algorithm

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define an Algorithm. With the help of a flowchart, explain the various steps in the algorithm design and analysis process.	8	L1	CO1
	b.	Explain Asymptotic notations Big O, Big Ω and Big θ that are used to compare the order of growth of algorithm with example.	8	L2	CO1
	c.	Discuss Brute Force string matching algorithm with example.	4	L2	CO1
		OR			
Q.2	a.	Write an algorithm to search a key using sequential search. Derive its time efficiency for best case, worst case and average case.	8	L2	CO1
	b.	Explain the general plan for analyzing time efficiency of recursive algorithm. Illustrate mathematical analysis of recursive algorithm for tower of Hanoi.	8	L2	CO1
	c.	Write selection sort algorithm with time complexity.	4	L2	CO1
		Module – 2			
Q.3	a.	What is topological sorting? Apply DFS and source removal method for below graph to solve topological sorting.  Fig. Q3 (a)	8	L3	CO2
	b.	Explain merge sort algorithm with example and discuss its best-case, average-case and worst case efficiency.	8	L2	CO2
	c.	Explain Exhaustive search technique for travelling salesman problem.	4	L2	CO2

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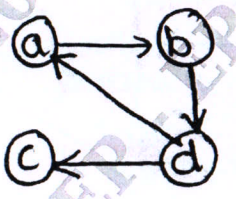
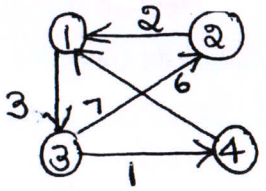
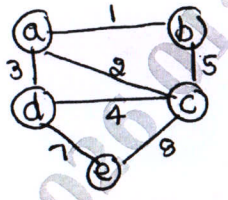
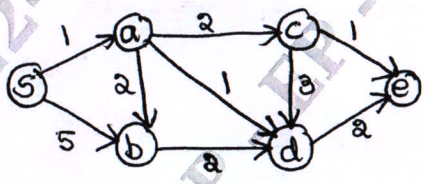
		OR			
Q.4	**a.**	Write an algorithm to sort 'n' numbers using Quick Sort. Trace the algorithm to sort the following list in ascending order 80, 60, 70, 40, 10, 30, 50, 20.	**8**	**L3**	**CO2**
	b.	Illustrate Strassen's matrix multiplication and derive its time complexity.	**8**	**L2**	**CO2**
	c.	Write an algorithm for insertion sort.	**4**	**L1**	**CO2**
		Module – 3			
Q.5	**a.**	Write an algorithm for Heap Sort. Sort the below given lists by heapsort using the array representation of heaps : SORTING (alphabetical order)	**10**	**L3**	**CO3**
	b.	(i) Construct an AVL tree for the list. 5, 6, 8, 3, 2, 4, 7 (ii) Construct an 2-3 tree for the list. 9, 5, 8, 3, 2, 4, 7	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Discuss comparision counting sort with an algorithm. Sort the following numbers using comparision counting sort: 25 45 10 20 50 15	**10**	**L3**	**CO3**
	b.	Explain Horspool's algorithm for string matching. Trace Horspool's algorithm to find the pattern 'DIRECTORS' in text 'IN THE DIRECT TO DIRECTORS SITUATION'	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define Transitive closure. Write Warshall's algorithm to compute transitive closure. Generate transitive closure of the graph given below:  Fig. Q7 (a)	**8**	**L3**	**CO4**
	b.	Apply Floyd's algorithm to find the all pair shortest path for the graph given below :  Fig. Q7 (b)	**8**	**L3**	**CO4**

	c.	Solve for the coin-row problem for the instance {7, 3, 9, 10, 8, 6}	4	L3	CO4
		OR			
Q.8	a.	Apply Prim's algorithm to find the minimal cost spanning tree for the graph given :  Fig.Q8 (a)	8	L3	CO4
	b.	Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering S as the source vertex.  Fig. Q8 (b)	8	L3	CO4
	c.	Construct a Huffman code for the following data: Character: A, B, C, D, - Probabiltiy: 0.4, 0.1, 0.2, 0.15, 0.15	4	L3	CO4
		Module – 5			
Q.9	a.	Explain the following with examples : (i) Class P problems (ii) NP complete problem.	10	L1	CO5
	b.	Give the problem statement of n-queens problem. Explain the solution for 4-queens problem using state space tree.	10	L2	CO6
		OR			
Q.10	a.	Explain how knapsack problem can be solved using branch and bound technique, with example.	10	L3	CO6
	b.	Discuss Decision tree for three element selection sort and binary search in a four element array.	10	L2	CO6

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