CBCS SCHEME

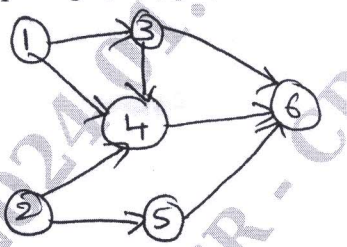
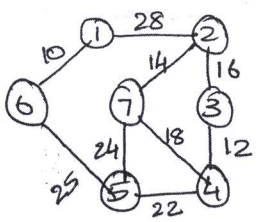
USN | | | | | | | | | | |

22MCA15

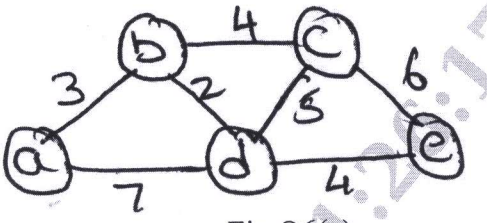
First Semester MCA Degree Examination, June/July 2024
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 100

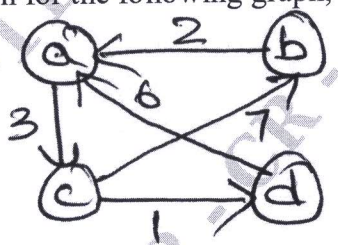
Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Illustrate the characteristics of an algorithm. Explain the different problem types of an algorithm.	10	L1	CO1
	b.	Explain asymptotic notations with an appropriate graphical representation.	10	L2	CO1
		OR			
Q.2	a.	Design a general plan for analyzing the non recursive algorithm. Provide an example for the same.	10	L3	CO2
	b.	Design a general plan for analyzing recursive algorithm and explain with an example.	10	L3	CO2
		Module – 2			
Q.3	a.	Design a binary search algorithm. Derive its time efficiency.	10	L3	CO2
	b.	Apply Strassen's matrix multiplication method to multiply the given two matrices below. Give its time efficiency. $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 1 & 6 \end{bmatrix}$	10	L3	CO2
		OR			
Q.4	a.	Obtain topological ordering of elements using DFS and Source Removal Method for the following graph Fig.Q4(a).  Fig.Q4(a)	10	L3	CO2
	b.	Define Heap. Construct a heap for the following data using heap sort. Given the time efficiency of Heap Sort: 7, 4, 3, 1, 2	10	L3	CO2
		Module – 3			
Q.5	a.	Let n = 6, profits = (23, 45, 6, 18, 60, 5) and deadlines = (3, 2, 1, 4, 2, 1). Find the optimal sequence of the execution of jobs using Greedy algorithm.	10	L3	CO1
	b.	Apply Kruskal algorithm to find minimum spanning tree for the below graph, Fig.Q5(b).  Fig.Q5(b)	10	L3	CO1

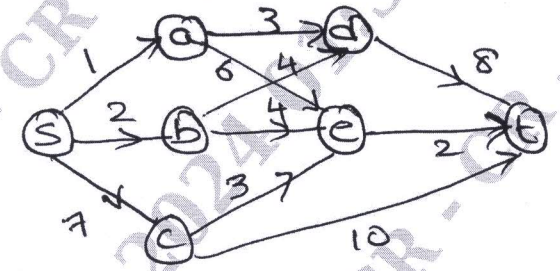
OR

Q.6	**a.**	Find the shortest path from vertex "a" to all other vertices for the following graph Fig.Q6(a).  Fig.Q6(a)	**10**	**L3**	**CO2**
	b.	Construct a Huffman code for the following data: Character: A, B, C, D, - Probability: 0.35, 0.1, 0.2, 0.2, 0.15 Find: (i) Huffman Tree (ii) Decode the string "1001101101001101"	**10**	**L3**	**CO2**

Module – 4

Q.7	**a.**	Find all pairs shortest path for the following graph, Fig.Q7(a).  Fig.Q7(a)	**10**	**L3**	**CO2**
	b.	Define transitive closure. Write Warshall's algorithm to compute transitive closure. Find its efficiency.	**10**	**L3**	**CO2**

OR

Q.8	**a.**	Apply multistage graph algorithm to find a minimum cost path from 's' to 't' for the following instance Fig.Q8(a).  Fig.Q8(a)	**10**	**L3**	**CO2**
	b.	Apply dynamics programming, find the optimal solution for the given instance below. With knapsack capacity W = 5. Item: 1, 2, 3, 4 Weight: 2, 1, 3, 2 Value: $12, $10, $20, $15	**10**	**L3**	**CO3**

Module – 5

Q.9	**a.**	Find the subset from the given set with d = 15, s = {3, 7, 5, 6} by constructing state space tree.	**10**	**L3**	**CO2**
	b.	Define N-Queen's problem. Find the solution space tree for 4-Queen's problem.	**10**	**L2**	**CO1**

OR

Q.10	**a.**	Solve the assignment problem using branch and bound method: | | 1 | 2 | 3 | 4 | | a | 8 | 1 | 6 | 7 | | b | 5 | 3 | 2 | 3 | | c | 4 | 7 | 5 | 7 | | d | 6 | 5 | 8 | 6 |	**10**	**L3**	**CO3**
	b.	Discuss briefly: (i) Random number generators (ii) Numerical Probabilistic Algorithms (iii) Monte Carlo Algorithms (iv) Las Vegas Algorithm (v) NP complete classes	**10**	**L2**	**CO1**

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