CBCS SCHEME

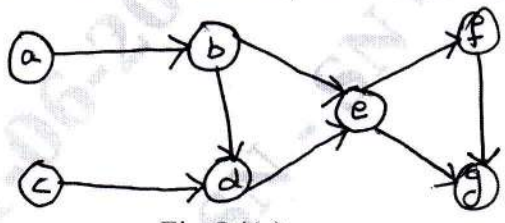
USN | | | | | | | | | | |

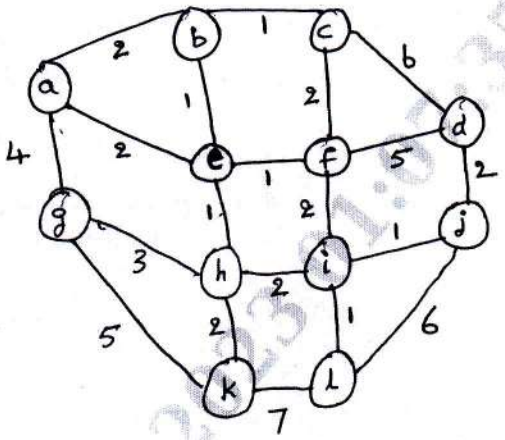
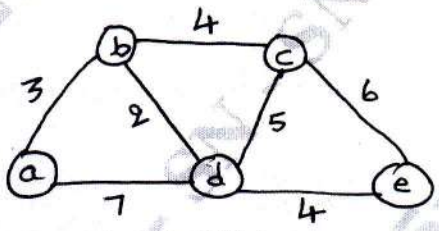
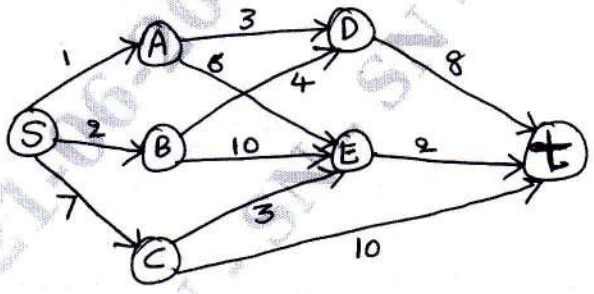
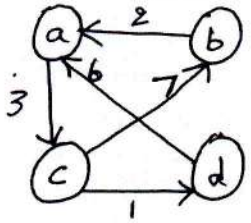
22MCA15

First Semester MCA Degree Examination, Jan./Feb. 2023
Design and Analysis of Algorithms

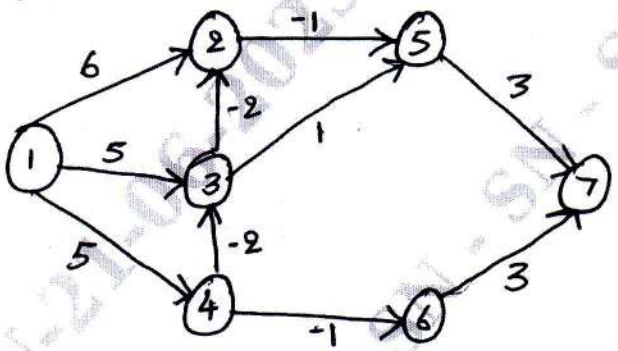
Time: 3 hrs. Max. Marks: 100

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 algorithm. Illustrate the characteristics of an algorithm.	06	L1	CO1
	b.	List and explain the different problem types of an algorithm.	04	L1	CO1
	c.	Explain asymptotic notations, with a diagram and explain with an example.	10	L2	CO1
		OR			
Q.2	a.	Design a general plan for analyzing the non recursive algorithm. Design an algorithm for element uniqueness in an array. Obtain its time complexity.	12	L3	CO2
	b.	List and explain the fundamental data structures with definition and examples.	08	L1	CO2
		Module – 2			
Q.3	a.	Design a binary search algorithm and derive its time complexity and apply the same to search an element "42" from the given elements. 3, 14, 27, 31, 40, 42, 55, 66	12	L3	CO2
	b.	Sort the following elements using Quick Sort. Show only 1st partition. 50, 30, 10, 90, 60, 40, 35, 62	08	L3	CO2
		OR			
Q.4	a.	Define Topological Sorting. Obtain the 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. Explain different types of heap. Sort the following elements using heap sort technique by creating bottom-up max heap tree. 26, 14, 18, 42, 6, 9, 38	10	L3	CO1
		Module – 3			
Q.5	a.	Consider the following jobs with their profits and deadlines. Find the executing job sequence using greedy to obtain max profit. $<p_1, p_2, p_3, p_4, p_5, p_6> = <23, 45, 6, 18, 60, 5>$ $<d_1, d_2, d_3, d_4, d_5, d_6> = <3, 2, 1, 4, 2, 1>$	10	L3	CO2

	b.	Apply Kruskal algorithm to find Minimum Spanning tree for the below graph, Fig.Q5(b).  Fig.Q5(b)	10	L3	CO3
		OR			
Q.6	a.	Find the shortest path from the vertex "d" to all other vertices for the below graph, Fig.Q6(a).  Fig.Q6(a)	10	L3	CO2
	b.	Construct a Huffman code for the following data: Character: A, B, C, D, - Prob: 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.	Apply Forward approach Multistage graph technique to find shortest path from S to t.  Fig.Q7(a)	10	L3	CO3
	b.	Find all pair shortest path for the below graph, Fig.Q7(b).  Fig.Q7(b)	10	L3	CO2

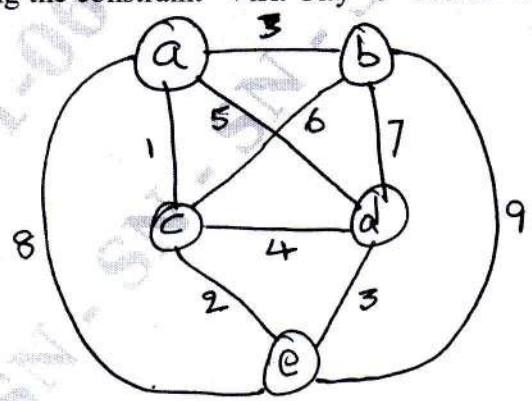
OR

Q.8	**a.**	Applying dynamic programming, find the optimal solution for the instance given below, with knapsack capacity W = 5. Item | Weight | Value 1 | 2 | $12 2 | 1 | $10 3 | 3 | $20 4 | 2 | $15	**10**	**L3**	**CO3**
	b.	Why we need Bellman-Ford algorithm? Apply the same to find the shortest path for the graph.  Fig.Q8(b)	**10**	**L3**	**CO3**

Module – 5

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

OR

Q.10	**a.**	Solve the assignment problem using branch and bound technique. | | d_1 | d_2 | d_3 | d_4 | p_1 | 9 | 2 | 7 | 8 | p_2 | 6 | 4 | 3 | 7 | p_3 | 5 | 8 | 1 | 8 | p_4 | 7 | 6 | 9 | 4 |	**10**	**L3**	**CO3**
	b.	Solve the following travelling salesman problem using branch and bound technique by using the constraint "Visit City "b" before "c" ".  Fig.Q10(b)	**10**	**L3**	**CO3**

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