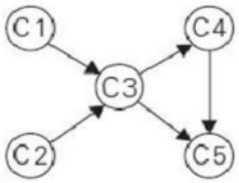
Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

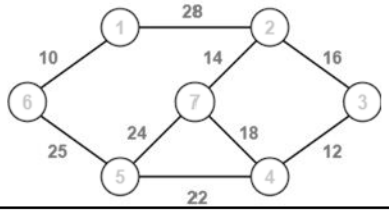
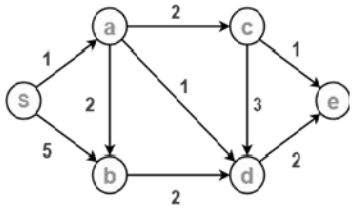
USN

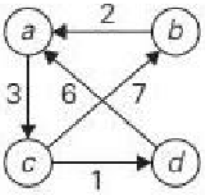
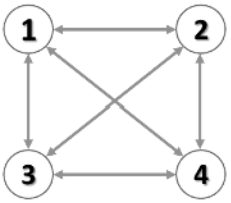
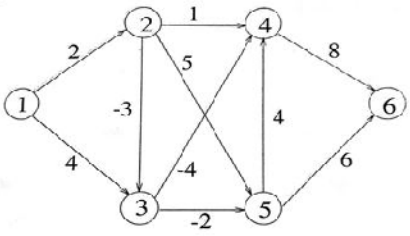
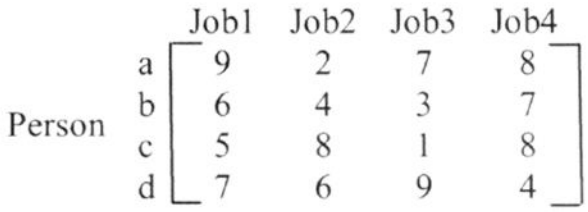
Fourth Semester B.E. Degree Examination
Design and Analysis of Algorithms

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	Bloom's Taxonomy Level	Marks
Q.01	**a**	Define an algorithm. Discuss the criteria of an algorithm with an example.	L1	6
	b	What are the various basic asymptotic efficiency classes? Explain Big O, Big Omega and Big Theta asymptotic notations.	L2	8
	c	Discuss about the important problem types and fundamental data structures.	L2	6
		OR		
Q.02	**a**	Outline an algorithm to find maximum of n elements and obtain its time complexity.	L2	7
	b	Design an algorithm to search an element in an array using sequential search. Discuss the Best case worst case and average case efficiency of this algorithm	L3	7
	c	Discuss adjacency matrix and adjacency list representation of graph with an example	L2	6
		Module-2		
Q. 03	**a**	Explain the concept of Divide and Conquer. Write the recursive algorithm to perform binary search on list of elements	L2	7
	b	Develop a recursive algorithm to find the minimum and maximum element from the list. Illustrate with an example.	L3	7
	c	Apply Quick sort on the following set of elements: 60, 70, 75, 80, 85, 60, 55, 50, 45	L3	6
		OR		
Q.04	**a**	Apply Source removal method to obtain Topological sort for the Given Graph: 	L3	6
	b	Write an algorithm to sort N numbers by applying Merge sort.	L3	7
	c	Apply Strassen's Matrix Multiplication method to multiply the given two matrices. Discuss how this method is better than general matrix multiplication method $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 1 & 6 \end{bmatrix}$	L3	7

		Module-3		
Q. 05	**a**	Apply Greedy method to obtain an optimal solution to the Knapsack problem where Knapsack capacity m=15. Object: 1 2 3 4 5 6 7 Weight: 10 5 15 7 6 8 3 Profit: 2 3 5 7 1 4 1	L3	7
	b	What is Job sequencing with deadlines problem? For the given data, find the optimal job sequence and maximum profit using Greedy approach. Jobs: J1 J2 J3 J4 J5 Profits: 60 100 20 40 20 Deadlines: 2 2 3 1 1	L2	6
	c	Apply Prim's algorithm to obtain the minimum cost spanning tree for the given weighted graph.  	L3	7
		OR		
Q. 06	**a**	Design Dijkstra's algorithm and apply the same to find single source shortest path for the given graph by considering 'S' as the source vertex  	L3	8
	b	Construct the Huffman tree for the following data Character: A B C D E - Probability: 0.5 0.35 0.5 0.1 0.4 0.2 Encode: a] BED b] AB_CD	L3	5
	c	Define Heap. Sort the given list of Elements using heap sort: 2, 9, 7, 6, 5, 8	L3	8
		Module-4		
Q. 07	**a**	Explain Multistage graphs with example. Write multistage graph algorithm using forward approach.	L2	6
	b	Write Warshall's algorithm to compute transitive closure of a directed graph. Apply the same on the graph defined by the following adjacency matrix: $A = \begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{array}$	L3	8
	c	Construct an optimal binary search tree for the following four–key set Key: A B C D Probability: 0.1 0.2 0.4 0.3	L3	6

		OR		
Q. 08	**a**	Apply Floyd's algorithm to find all pair shortest path for the given graph 	L3	7
	b	Find the optimal tour for sales person using dynamic programming technique for the given graph and its corresponding edge length matrix  $\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$	L3	7
	c	Find the shortest path from node 1 to every other node in the given graph using Bellman-Ford algorithm 	L3	6
		Module-5		
Q. 09	**a**	What is the central principle of backtracking? Apply backtracking to solve the below instance of sum of subset problem S = {5, 10, 12, 13, 15, 18} d = 30.	L3	7
	b	Solve the below instance of assignment problem using branch and bound algorithm 	L3	7
	c	What is Hamiltonian circuit problem? What is the procedure to find Hamiltonian circuit of a graph?	L2	6
		OR		
Q. 10	**a**	Illustrate N Queen's Problem using Back tracking to solve 4 Queen's problem	L3	8
	b	Explain the following: **a]** LC Branch and bound **b]** FIFO Branch and bound	L2	6
	c	Explain the classes of NP-Hard and NP-Complete problems	L2	6