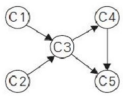
Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

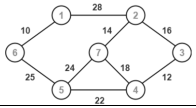
USN

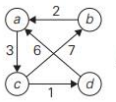
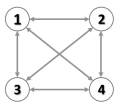
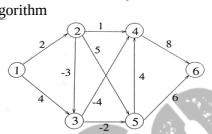
Fourth Semester B.E. Degree Examination
Design and Analysis of Algorithms

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 Person $\begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{c} \begin{array}{cccc} Job1 & Job2 & Job3 & Job4 \end{array} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \end{array}$	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