Model Question Paper with effect from 2023-24 (CBCS Scheme)

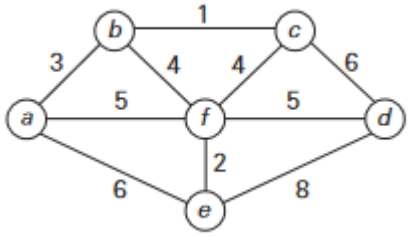
USN | | | | | | | | | | |

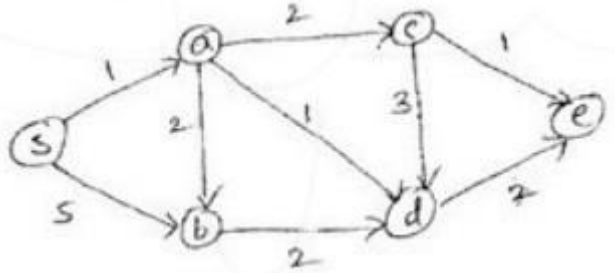
Fourth Semester B.E. Degree Examination

Analysis and Designs of Algorithms

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

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	BL		Marks
Q.01	a	Define algorithm. Explain asymptotic notations Big Oh, Big Omega and Big Theta notations	L2		08
	b	Explain the general plan for analyzing the efficiency of a recursive algorithm. Suggest a recursive algorithm to find factorial of number. Derive its efficiency	L2		08
	c	If $t1(n) \in O(g1(n))$ and $t2(n) \in O(g2(n))$, then show that $t1(n) + t2(n) \in O(\max\{g1(n), g2(n)\})$.	L2		04
		OR			
Q.02	a	With neat diagram explain different steps in designing and analyzing an algorithm	L2		08
	b	Explain the general plan for analyzing the efficiency of a non-recursive algorithm. Suggest a non-recursive algorithm to find maximum element in the list of n numbers. Derive its efficiency	L2		08
	c	With the algorithm derive the worst case efficiency for Bubble sort	L2		04
		Module-2			
Q. 03	a	Explain the concept of divide and conquer. Design an algorithm for merge sort and derive its time complexity	L2		10
	b	Design an insertion sort algorithm and obtain its time complexity. Apply insertion sort on these elements. 25,75,40,10,20,	L3		10
		OR			
Q.04	a	Explain Strassen's matrix multiplication and derive its time complexity	L2		10
	b	Design an algorithm for quick sort algorithm. Apply quick sort on these elements. 25,75,40,10,20,05,15	L3		10
		Module-3			
Q. 05	a	Define AVL Trees. Explain its four rotation types	L2		10
	b	Construct bottom up heap for the list 2,9,7,6,5,8. Obtain its time complexity	L3		10
		OR			
Q. 06	a	Define heap. Explain the properties of heap along with its representation.	L2		10
	b	Design Horspools algorithm for string matching. Apply Horspools algorithm to find the pattern BARBER in the text: JIM_SAW_ME_IN_A_BARBERSHOP	L3		10
		Module-4			
Q. 07	a	Construct minimum cost spanning tree using Kruskals algorithm for the following graph. 	L3		10
	b	What are Huffman Trees? Construct the Huffman tree for the following data. <table><tr><td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>-</td></tr><tr><td>Probability</td><td>0.5</td><td>0.35</td><td>0.5</td><td>0.1</td><td>0.4</td><td>0.2</td></tr></table> Encode DAD-CBE using Huffman Encoding.	L3		10

		OR			
Q. 08	a	Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering S as the source vertex.  	L3		10
	b	Define transitive closure of a graph. Apply Warshalls algorithm to compute transitive closure of a directed graph $\begin{array}{c} \\ a \\ b \\ c \\ d \end{array}\begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{array}$	L3		10
		Module-5			
Q. 09	a	Explain the following with examples i) P problem ii) NP Problem iii) NP- Complete problem iv) NP – Hard Problems	L2		10
	b	What is backtracking? Apply backtracking to solve the below instance of sum of subset problem S={5,10,12,13,15,18} d=30	L3		10
		OR			
Q. 10	a	Illustrate N queen's problem using backtracking to solve 4-Queens problem	L2		10
	b	Using Branch and Bound technique solve the below instance of knapsack problem. Capacity 5	L3		10

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	5