

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

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

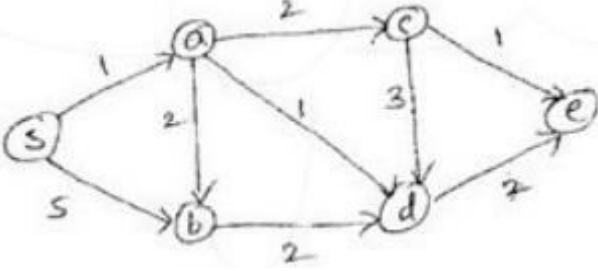
TIME: 03 Hours

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 $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$, then show that $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$.	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.	L3	10														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <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>	Character	A	B	C	D	E	-	Probability	0.5	0.35	0.5	0.1	0.4	0.2		
Character	A	B	C	D	E	-												
Probability	0.5	0.35	0.5	0.1	0.4	0.2												
		Encode DAD-CBE using Huffman Encoding.																

OR

Q. 08	a	<p>Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering S as the source vertex.</p> 	L3	10
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	b	<p>Define transitive closure of a graph. Apply Warshalls algorithm to compute transitive closure of a directed graph</p> $ \begin{matrix} & a & b & c & d \\ a & \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix} \\ b & \begin{bmatrix} 0 & 0 & 0 & 1 \end{bmatrix} \\ c & \begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix} \\ d & \begin{bmatrix} 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix} $	L3	10
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Module-5

Q. 09	a	<p>Explain the following with examples</p> <ul style="list-style-type: none"> i) P problem ii) NP Problem iii) NP- Complete problem iv) NP – Hard Problems 	L2	10
	b	<p>What is backtracking? Apply backtracking to solve the below instance of sum of subset problem S={5,10,12,13,15,18} d=30</p>	L3	10

OR

Q. 10	a	<p>Illustrate N queen's problem using backtracking to solve 4-Queens problem</p>	L2	10															
	b	<p>Using Branch and Bound technique solve the below instance of knapsack problem.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Weight</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> <td>12</td> </tr> <tr> <td>2</td> <td>1</td> <td>10</td> </tr> <tr> <td>3</td> <td>3</td> <td>20</td> </tr> <tr> <td>4</td> <td>2</td> <td>5</td> </tr> </tbody> </table> <p>Capacity 5</p>	Item	Weight	Value	1	2	12	2	1	10	3	3	20	4	2	5	L3	10
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