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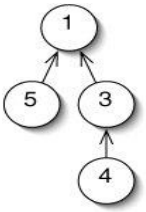
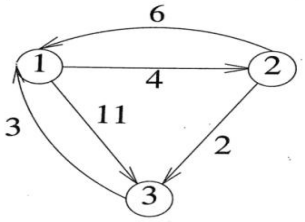
Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

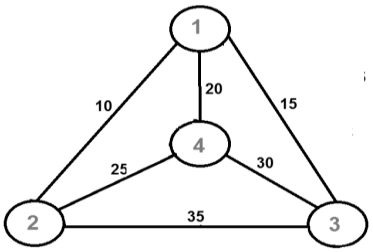
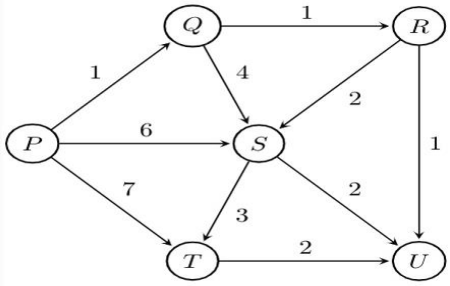
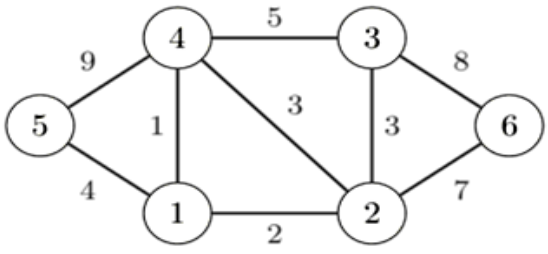
Fourth Semester B.E. Degree Examination

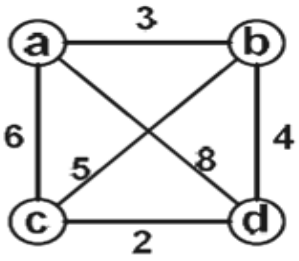
Design and Analysis of Algorithms

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. 1	a	Define an Algorithm. Explain the characteristics of an Algorithm.	L1, L2	06
	b	Explain the Divide and Conquer technique.	L2	04
	c	Explain the Merge Sort algorithm. Apply Merge Sort algorithm to sort the given characters. U N I V E R S I T Y	L3	10
		OR		
Q. 2	a	Explain the following Asymptotic notations: (i) Big O (ii) Big Ω (iii) Theta Θ	L1, L2	06
	b	Explain how Strassen's algorithm is better for matrix multiplication.	L2	04
	c	Write the algorithm for Binary Search. Apply Binary Search algorithm to find the key value 63 from the given array. 7 14 21 28 35 42 49 56 63 70	L3	10
		Module-2		
Q. 3	a	What are Disjoint Sets? Give the Tree, Data and Array representation for the given three sets: S_1 = {3, 7 , 8, 9}, S_2 = {2, 4, 5} and S_3 = {1, 6}	L1, L2	05
	b	Explain how Union algorithm works on Disjoint Sets with an example.	L2	05
	c	Solve the 4-Queens Problem by using the Backtracking approach.	L3	10
		OR		
Q. 4	a	Explain the Graph Coloring Problem with an example.	L2	05
	b	Apply Find algorithm to search for an element 4 in the given tree. 	L3	05
	c	Apply Backtracking technique to solve the Sum of Subset Problem for the instance d = 15 and S = {3, 5, 6, 7}.	L3	10
		Module-3		
Q. 5	a	Find the all pairs shortest paths for the given graph using Floyd's algorithm. 	L3	10

	b	Apply Dynamic Programming to solve the given travelling salesperson problem.  	L3	10
		OR		
Q. 6	a	Construct an Optimal Binary Search Tree for the given data: n = 4 (a_1, a_2, a_3, a_4) = (do, if, int, while) p(1:4) = (3, 3, 1 ,1) q(0:4) = (2, 3, 1, 1, 1).	L3	10
	b	Using Dynamic Programming, solve the given instance of 0/1 Knapsack problem. Consider the capacity of Knapsack (m) = 5. Item | 1 | 2 | 3 | 4 Weight | 2 | 1 | 3 | 2 Value | 12 | 10 | 20 | 15	L3	10
		Module-4		
Q. 7	a	Apply single source shortest path algorithm to the given graph by considering 'P' as source vertex.  	L3	10
	b	Apply Greedy method for the following instance of Knapsack problem. Given: Knapsack capacity (M) = 15. Item | 1 | 2 | 3 | 4 | 5 | 6 | 7 Weight | 2 | 3 | 5 | 7 | 1 | 4 | 1 Profit | $ 10 | $ 5 | $ 15 | $ 7 | $ 6 | $ 18 | $ 3	L3	10
		OR		
Q. 8	a	Apply Prim's algorithm to obtain a minimum cost spanning tree for the given graph.  	L3	10
	b	For the given data, find the optimal job sequence and maximum profit using Greedy approach. Job | J1 | J2 | J3 | J4 | J5 Profit | 60 | 100 | 20 | 40 | 20 Deadline | 2 | 2 | 3 | 1 | 1	L3	10

<table>
<tr><th colspan="3">Module-5</th><th></th><th></th></tr>
<tr><td rowspan="2">Q. 9</td><td>a</td><td>Solve the given instance of 0/1 Knapsack problem using Branch and Bound technique. Given: Knapsack Capacity (m) = 15
<table>
<tr><td>Item</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Profit</td><td>10</td><td>10</td><td>12</td><td>18</td></tr>
<tr><td>Weight</td><td>2</td><td>4</td><td>6</td><td>9</td></tr>
</table></td><td>L3</td><td>10</td></tr>
<tr><td>b</td><td>Explain the following:
(i) Class P
(ii) Class NP
(iii) NP Complete Problem
(iv) NP Hard Problem.</td><td>L2</td><td>10</td></tr>
<tr><td colspan="3">OR</td><td></td><td></td></tr>
<tr><td rowspan="2">Q. 10</td><td>a</td><td>Apply the Branch and Bound algorithm to solve the travelling salesperson problem for the given graph.
 
</td><td>L3</td><td>10</td></tr>
<tr><td>b</td><td>Explain:
(i) Cook’s theorem
(ii) Non-deterministic algorithms.</td><td>L2</td><td>10</td></tr>
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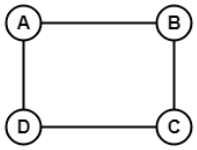
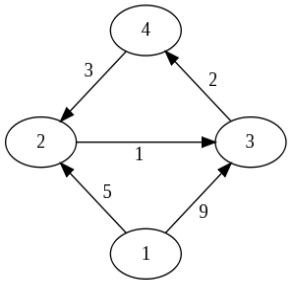
Model Question Paper-2 with effect from 2022-23 (CBCS Scheme)

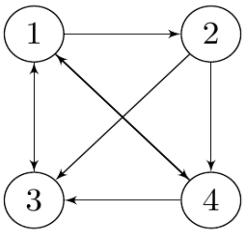
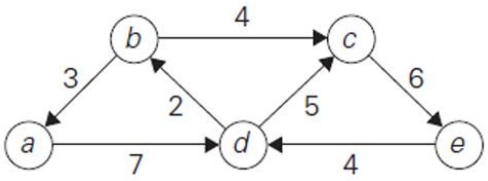
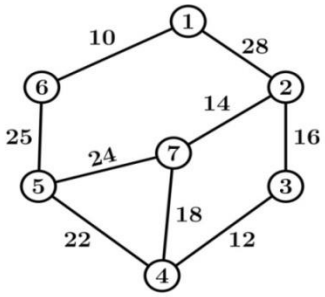
Fourth Semester B.E. Degree Examination

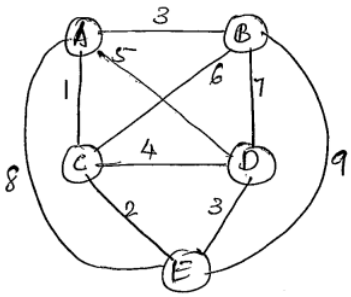
Design and Analysis of Algorithms

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. 1	a	Apply Strassen's algorithm to multiply the following matrices. $\begin{bmatrix}4 & 3\\1 & 2\end{bmatrix} * \begin{bmatrix}1 & 2\\6 & 5\end{bmatrix}$	L3	10
	b	What are the criteria that an algorithm must satisfy?	L1	05
	c	Explain Space Complexity and Time Complexity of an algorithm.	L2	05
		OR		
Q. 2	a	Apply Quick Sort algorithm to the following set of numbers. 65, 70, 75, 80, 85, 60, 55, 50, 45	L3	10
	b	What are Asymptotic Notations? List and describe the various asymptotic notations.	L1, L2	10
		Module-2		
Q. 3	a	Apply Backtracking technique to solve the Sum of Subset Problem for the instance d = 7 and S = {1, 3, 4, 6}.	L3	10
	b	Explain the following operations of Disjoint Sets: (i) Union (ii) Find	L2	10
		OR		
Q. 4	a	Construct the state space tree using Graph Coloring approach for the given graph when m=3. 	L3	10
	b	Discuss the N-Queens Problem using Backtracking approach.	L2	10
		Module-3		
Q. 5	a	What is an Optimal Binary Search Tree? Obtain an Optimal Binary Search Tree for the given data: (a_1, a_2, a_3, a_4) = (end, goto, print, stop) $p_1 = \frac{1}{20}$, $p_2 = \frac{1}{5}$, $p_3 = \frac{1}{10}$, $p_4 = \frac{1}{20}$ $q_0 = \frac{1}{5}$, $q_1 = \frac{1}{10}$, $q_2 = \frac{1}{5}$, $q_3 = \frac{1}{20}$, $q_4 = \frac{1}{20}$	L1, L3	10
	b	Apply all pairs shortest path algorithm for the given graph. 	L3	10

		OR		
Q. 6	a	State Traveling Salesperson Problem. For the given cost matrix, obtain the optimal cost tour for the travelling salesperson using Dynamic Programming.  $\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$	L1, L3	10
	b	Solve the given instance of 0/1 Knapsack problem using Dynamic Programming. Given the capacity of Knapsack (m) = 8. Item 1 2 3 4 Weight 2 3 4 5 Profit 1 2 5 6	L3	10
		Module-4		
Q. 7	a	Apply Greedy method for the following instance of Knapsack problem, where Knapsack capacity (M) = 5. Item 1: Weight 2, Value $12 Item 2: Weight 1, Value $10 Item 3: Weight 3, Value $20 Item 4: Weight 2, Value $15	L3	07
	b	Apply Dijkstra's algorithm to the given graph by considering 'a' as source.  	L3	08
	c	What is Job Sequencing with Deadlines problem? Explain.	L2	05
		OR		
Q. 8	a	Define minimum cost spanning tree. Obtain a minimum cost spanning tree for the given graph using (i) Prim's Algorithm and (ii) Kruskal's Algorithm.  	L1, L3	15
	b	Explain the concept of Reliability Design when devices are connected in series and parallel.	L2	05
		Module-5		
Q. 9	a	State and explain Cook's theorem.	L1, L2	05
	b	Write a note on Non-deterministic algorithms.	L2	05
	c	Obtain LC Branch and Bound solution to the given 0/1 Knapsack problem, which has a capacity of 15. Item 1 2 3 4 Weight 2 4 6 9 Value 10 10 12 18	L3	10

		OR		
Q. 10	a	Explain the following: (i) Class P (ii) Class NP (iii) NP Complete Problem (iv) NP Hard Problem.	L1, L2	10
	b	Solve the given traveling salesperson problem using Branch and Bound technique. 	L3	10

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