R18   B.T.No.   R   0
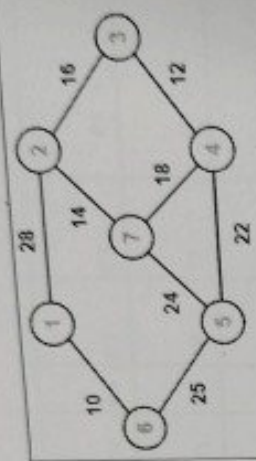
Code No.: CS-PCC-311

CMR INSTITUTE OF TECHNOLOGY: HYDERABAD
UGC AUTONOMOUS
III - B.Tech. – I – Semester End Examinations (supply)–June– 2022
DESIGN & ANALYSIS OF ALGORITHMS
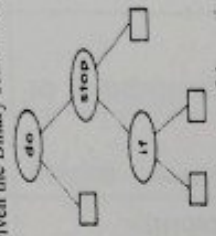(COMPUTER SCIENCE AND ENGINEERING)

[Time: 3 Hours]   [Max. Marks: 70]

Answer Any Five Questions. Each Question Carries 14 Marks

[5 x 14=70M]

S.No.	Question	BTL	CO	PO
1	i. Justify the need for asymptotic notations?	V	1	2,3,12,13
	ii. Construct the recurrence relation for Merge sort and solve it.			
2	Solve the two recurrence relations given below	III	1	2,3,12,13
	a. $T(n)=4T(n/2)+n$			
	b. $T(n)=2T(n/2)+n\log n$			
3	i. Develop the best and worst instance (Input) for quick sort and trace the quick sort and justify the time complexity	III	2	2,3,12,13
	ii. What is articulation point and Illustrate a method to generate the articulation point for a given graph	II		
4	i. A list of n strings, each of the length n is sorted in lexicographic order using the merge-sort algorithm. Develop the algorithm and deduce the worst case running time of the algorithm	III	2	2,3,12,13
	ii. Apply the Disjoint sets data structure to any real world problem			
5	i. Given the graph and cost adjacency matrix of a Travelling salesperson problem. Compute g(4,{2,3}) using dynamic programming. The cost adjacency matrix is	III	3	2,3,12,13

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

ii. Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm-

6	i. Given the Binary search tree as mentioned below:	III	3	2,

What is the cost of the optimal binary search tree if $p(i)=1/7$ and $q(i)=1/7$ for all i and j ?

ii. Obtain the optimal job sequence for the jobs with profits (100,10,15,27) a deadlines (2,1,2,1)

| 7 | i. Find the all possible solutions for 4-queens problem using Backtracking. Explain the solution with the help of NQueens() algorithm. | III | 4 | 2,3 |

ii. You are given a knapsack that can carry a maximum weight of 50. There are items with profit values {60, 100, 120} and weight values {10, 20, 30}. Obtain t maximum profit value of the items you can carry using the knapsack using Brach a Bound approach

| 8 | i. Write short notes Cooks Theorem | III | 2 | 2,3,12,13 |
| | | II | 5 | 2,3 |

ii. Prove Knapsack Problem is NP-Complete

| | | IV | | |

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