



CMR INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
DAA QUESTION BANK (2021-22)
(Long Answer Questions)

UNIT-I

1. Discuss in detail the properties/Criteria of an algorithm
2. Explain Algorithm Design steps.
3. What is Pseudo Code? Explain the steps required for writing a Pseudo Code.
4. Distinguish between Priori and Posteriori analysis.
5. Explain Time Complexity with examples Using Counter method.
6. Explain Time Complexity with examples Using Tabular method.
7. Discuss Space Complexity with examples.
8. Discuss all the Asymptotic Notations with suitable examples.
9. Describe Performance Analysis with examples.

UNIT-II

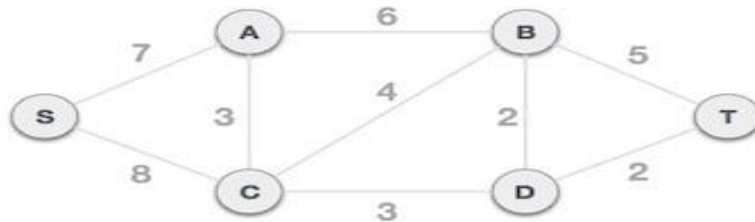
1. What do you mean by Dis-Joint sets? Explain all the operations can be performed on Dis-Joint sets.
2. Explain Simple UNION and Weighted UNION algorithm with example
3. Discuss Simple FIND and Collapsing FIND algorithm with example
4. Define the following with example: a) Spanning Trees b) Connected Components c) Bi-Connected Components d) Articulation Points
5. What is Divide-and Conquer method? Explain General Method (Control Abstraction) of Divide-and Conquer
6. Write both Recursive and Non-Recursive algorithms on Binary Search
7. Sort the following list of elements using Quick Sort : 65, 70, 75, 80, 85, 60, 55, 50, 45
8. Write the Quick Sort and Merge Sort Algorithms

9. Derive the Best Case, Average case and Worst case Time Complexity of Quick Sort
10. A) Discuss the Merge Sort algorithm and sort the following list using Merge Sort:
234,261,112,203,495,315,321

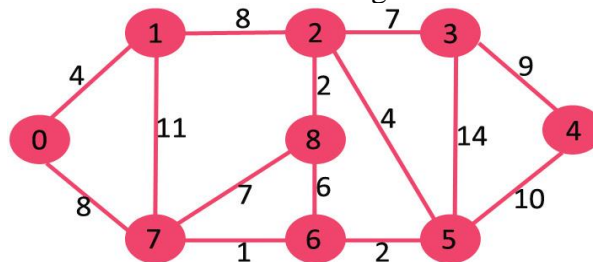
B) Derive the Time Complexity of Merge Sort
11. Explain Strassen's Matrix Multiplication. Also derive the time Complexity of Strassen's Matrix Multiplication.

UNIT-III

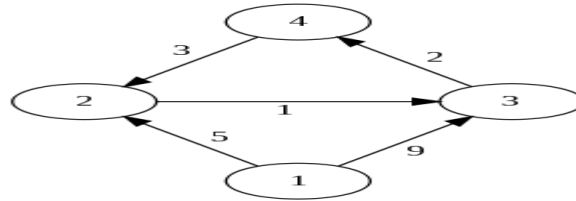
1. Explain General Methods of Greedy Approach and Dynamic Programming Approach
2. Construct the solution for the following Job Sequencing with Deadline problem instance. $n=7$, $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (3, 5, 20, 18, 1, 6, 30)$ and $(d_1, d_2, d_3, d_4, d_5, d_6, d_7) = (1, 3, 4, 3, 2, 1, 2)$. Also write the Job Sequencing with Deadline algorithm.
3. Consider the following Knapsack problem instance and Construct an optimal solution using Greedy Method. Let $n=5$, $(p_1, p_2, \dots, p_5) = (w_1, w_2, \dots, w_5) = (4, 4, 5, 8, 9)$ and $m=15$. Also write the algorithm for Knapsack problem
4. Explain (write) Prim's Algorithm. Construct the Minimum Cost Spanning Tree for the following graph using Prim's Algorithm



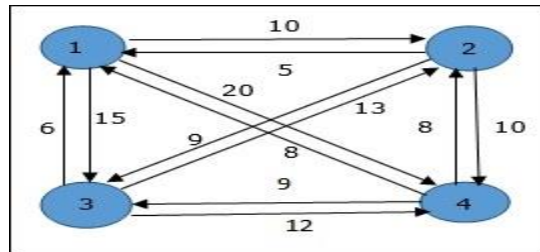
5. Explain (write) Kruskal's algorithm. Construct the Minimum Cost Spanning Tree for the above graph using Kruskal's Algorithm.
6. Consider the following graph and apply single source shortest path algorithm and find the shortest path from node 0 to all the remaining nodes.



7. Construct an optimal Binary search tree from the following data : $n=4$,
 $(a_1, a_2, a_3, a_4) = (\text{do}, \text{if}, \text{int}, \text{while})$ and $p(1:4) = (3, 3, 1, 1)$ and $q(0:4) = (2, 3, 1, 1, 1)$.
8. Solve the following 0/1 Knapsack problem instance: $n=4$, Weights: $\{3, 4, 6, 5\}$
Profits: $\{2, 3, 1, 4\}$ and $m=8$ using Dynamic Programming.
9. Construct all the shortest paths for the given graph using all pairs shortest path problem



10. Construct an optimal tour for the following graph using Travelling salesperson problem

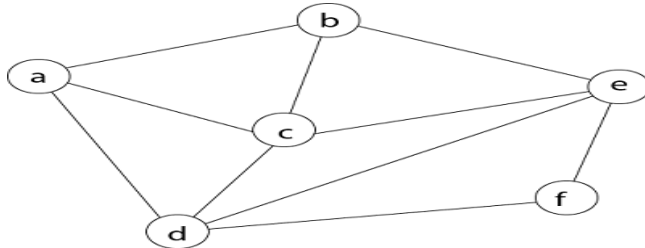


11. Design a three stage system with device types D1, D2, D3. The costs are Rs. 30, Rs. 15 and Rs. 20 respectively. The cost of the system is to be no more than Rs. 105. The reliability of each device type is 0.9, 0.8 and 0.5 respectively.

UNIT-IV

1. Explain General Method of Backtracking and Branch and Bound
2. Write an N-Queens algorithm? Explain 4-Queens algorithm with State Space Tree and Solution Tree.
3. Consider the set $S = \{5, 10, 12, 13, 15, 18\}$ and $m=30$. Find all the possible solutions using sum-of-subsets problem. Also write the sum-of-subsets algorithm

- Define Graph Coloring? Construct the state space tree for $n(\text{no. of nodes})=4$ and $m(\text{no. of Colors})=3$. Also write the algorithm of Graph Coloring.
- Write an algorithm for Hamiltonian Cycle. Find the Hamiltonian cycle for the following graph using backtracking



- Differentiate FIFO, LIFO and LC Branch and Bound Techniques
- Solve the following Travelling salesperson problem using LC - Branch and Bound

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	30	10	11
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

- Solve the given 0/1 Knapsack instance using FIFO Branch-and-Bound: $n = 4$, $m = 15$, $P[] = \{10, 10, 12, 18\}$, $W[] = \{2, 4, 6, 9\}$
- Solve the given 0/1 Knapsack instance using LC Branch-and-Bound: $n = 4$, $m = 15$, $P[] = \{10, 10, 12, 18\}$, $W[] = \{2, 4, 6, 9\}$
- Consider the travelling salesperson instance defined by the cost matrix. Obtain the reduced cost matrix and the portion of the state space tree that will be generated by LCBB.

∞	7	3	12	8
3	∞	6	14	9
5	8	∞	6	18
9	3	5	∞	11
18	14	9	8	∞

UNIT-V

- State the Classes of NP-hard and NP-complete?
- Explain about satisfiability problem with example?
- State Cook's theorem and explain its importance?
- Explain P-Class and NP-Class Problems
- Prove that Clique Decision problem is NP-Complete
- Discuss Non-Deterministic Algorithms with example.