**Department of Computer Science and Engineering**

**Unit wise Question Bank**

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| **UNIT-I** | | | | | |
| **Q.No** | **Question** | **Marks** | **CO** | **RBT** |
| **1** | Explain different Criteria of an Algorithm and Discuss about the Time and Space Complexities.. | 8 M | 1 | 2 |
| 2 | Write about the Pseudo Code Conventions? And Explain about different Asymptotic notations with examples? | 8 M | 1 | 1 |
| 3 | Explain about the techniques (Step Count Method) OR (Step Table Methods) for calculating the time Complexity of an algorithm and Generate the time taken for the algorithm of ( matrix multiplication OR transpose of a matrix m x n ) and by using either (step – count method) OR (Step-Table Method). | 8 M | 1 | 3 |
| 4 | Discuss about the Recursion and Design an algorithm to solve the towers of Hanoi problem. | 8 M | 1 | 3 |
| 5 | Explain about Different types of Asymptotic Notations | 8 M | 1 | 2 |
| 6 | Write the Difference between Mathematical Analysis and Empirical Analysis and Write Space Complexity for Recursive facorial | 8M | 1 | 1 |
| **UNIT-II** | | | | | |
| **Q.No** | **Question** | **Marks** | **CO** | **RBT** |
| 1 | Explain about the general abstraction for the Divide and Conquer Strategy? | 8M | 2 | 1 |
| 2 | Explain the Binary Search Algorithm? Calculate Time Complexity of it? | 8M | 2 | 3 |
| 3 | Explain the Quick Sort Algorithm? Calculate Time Complexity of it? Draw the tree of calls of Quicksort for the following set of elements, (20, 30, 10, 40, 5, 60, 90, 45, 35, 25, 15, 55) | 8M | 2 | 3 |
| 4 | Explain the Merge Sort Algorithm? Calculate Time Complexity of it? Draw the tree of calls of merge sort for the following set310, 285, 179, 652, 351, 423, 861, 254, 450, 520 using merge sort algorithm and draw the tree of calls of merge sort | 8M | 2 | 3 |
| 5 | Explain about the Process of Tiling the Defective Chess Board with neat Diagrams | 7M | 2 | 2 |
| 6 | Discuss and write the General Control Abstraction for Greedy Technique and Find the optimal solution of the knapsack instance n = 7, M = 15, (p1, p2, …p7) = (10, 5, 15, 7, 6, 18, 3) and (w1, w2, ……w7) = (2, 3, 5, 7, 1, 4, 1). | 8M | 2 | 3 |
| 7 | Discuss about the Minimum Cost Spanning tree? Explain how to find the minimum cost spanning tree by using Prim’s algorithm with your own example. | 8M | 2 | 2 |
| 8 | Discuss about the Minimum Cost Spanning tree? Explain how to find the minimum cost spanning tree by using Krushkal's algorithm with your own example. | 8M | 2 | 2 |
| **UNIT-III** | | | | | |
| **Q.No** | **Question** | **Marks** | **CO** | **RBT** |
| 1 | Discuss about the Dynamic Programming. Explain about i) Principles of optimality ii) Feasible solution iii) Optimal solution. And also diffrentiate how the Dynamic Programming is different from Divide and Conquer. | 8M | 3 | 2 |
| 2 | Discuss about the Algorithm for All Pairs Shortest Path problem and Apply the Same on the following graph | 8M | 3 | 3 |
| 3 | Describe the Dynamic 0/1 Knapsack Problem. Find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3 ) = (1,2,5), weights are (w1,w2,w3)=(2,3,4). | 5M | 4 | 4 |
| 4 | Discuss about the Optimal Binary Search Tree and Construct the OBST with 4 nodes ie. n=4 and {a1, a2, a3, a4} = {do, if ,int, while} let P(1:4) = (3, 3, 1, 1), q(0:4) = (2, 3, 1, 1, 1). | 5M | 4 | 4 |
| 5 | Explain the problem of Travelling Sales person. And Solve the TSP for the graph edge costs given by the following Cost Adjacency matrix | 5M | 4 | 4 |
| 6 | Explain Reliability Design Problem. Design a three stage system with device Types D1, D2, D3 with costs of Rs. 30, Rs 20, Rs. 15 Rupees 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. | 5M | 4 | 4 |

**Sample Quiz Questions**

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| **1. Performance based criteria of algorithm, which has to do with its storage requirements is \_\_\_\_\_\_\_\_\_\_\_** | | | | **[** | **B** | **]** |
| A) Time Complexity | B) Space Complexity | C) Input | D) Finiteness |  |  |  |
| **2. What term is used to describe an O(n) algorithm?** | | | | **[** | **D** | **]** |
| A) Constant | B) Non Polynomial Deterministic | C) Logarithmic | D) Linear |  |  |  |
| **3) Graphical representation of algorithm is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | | | | **[** | **B** | **]** |
| A) Pseudo-code | B) Flow Chart | C) Graph Coloring | D) Dynamic programming |  |  |  |
| **4. In pseudo-code conventions input express as \_\_\_\_\_\_\_\_\_\_** | | | | **[** | **C** | **]** |
| A) Input | B) Write | C) Read | D) Return |  |  |  |
| **5. \_\_\_\_\_\_\_\_\_\_ is a step-by-step procedure for calculations** | | | | **[** | **C** | **]** |
| A) Program | B) Greedy Method | C) Algorithm | D) Problem |  |  |  |
| **6. The general criteria of algorithm; Each instruction is clear and unambiguous \_\_\_\_\_\_** | | | | **[** | **B** | **]** |
| A) Output | B) Definiteness | C) Effectiveness | D) Input |  |  |  |
| **7. Two main measures for the efficiency of an algorithm are** | | | | **[** | **B** | **]** |
| Processor and memory | B) Time and space | C) Complexity and capacity | D) Data and space |  |  |  |
| **8. The complexity of multiplying two matrices of order m\*n and n\*p is** | | | | **[** | **A** | **]** |
| (A) mnp | B) mp | C) mn | D) np |  |  |  |
| **9. Quick sort is solved using** | | | | **[** | **A** | **]** |
| A) Divide and conquer | B) Greedy Programming | C) Dynamic Programming | D) Branch and bound |  |  |  |
| **10. Worst case complexity of quick sort is** | | | | **[** | **D** | **]** |
| A) O(n3) | B) O(logn) | C) O(nlogn) | D) O(n2) |  |  |  |
| **11. The sub problems in Divide and Conquer are considered to be** | | | | **[** | **A** | **]** |
| A) Non-overlapping | B) overlapping | C) large size | D) None |  |  |  |
| **12. The total number of companions required to merge 4 sorted files containing 15, 3, 9 and 8 records into a single sorted file is** | | | | **[** | **A** | **]** |
| A) 66 | B) 39 | C) 15 | D) 33 |  |  |  |
| **13. The running time of kruskal’s algorithm for MST** | | | | **[** | **C** | **]** |
| A) O(E) | B) O(V) | C) O(E log V) | D) all of the above |  |  |  |
| **14. The running time of Dijkastra’s algorithm is** | | | | **[** | **A** | **]** |
| A) O(V^2) | B) O(V+E) | C) O(n log n) | D) all of the above |  |  |  |
| **15. For the quick sort algorithm, what is the time complexity of the best & worst case?** | | | | **[** | **D** | **]** |
| A) best case: O(n) worst case: O(n\*n) | B) best case: O(n) worst case: O(n\*log(n)) | C) best case: O(n\*log(n)) worst case: O(n\*log(n)) | D) best case: O(n\*log(n)) worst case: O(n\*n) |  |  |  |
| **16. The time complexity of binary search in best, worst cases for an array of size N is** | | | | **[** | **D** | **]** |
| A) N, N2 | B) 1, Log N | C) Log N, N2 | D) 1, N log N |  |  |  |
| **17. In the\_\_\_\_\_\_\_\_\_\_\_\_\_\_Algoritms, for the construction of minimal spanning tree for a graph, the selected edges always form a FOREST.** | | | | **[** | **B** | **]** |
| A) Prim’s | B) Kruskal’s | C) Dijkastra’s | D) None |  |  |  |
| **18. In Knapsack problem, the best strategy to get the optimal solution, where Pi, Wi is the Profit, Weight associated with each of the Xi th object respectively is to Arrange the values** | | | | **[** | **C** | **]** |
| A) Pi/Wi in ascending order | B) Pi/Xi in ascending order | C) Pi/Wi in descending order | D) Pi/Xi in descending order |  |  |  |
| **19. The divide and conquer merge sort algorithm’s time complexity can be defined as** | | | | **[** | **D** | **]** |
| A) O (log n) | B) O (n) | C) O (n\*n) | D) O (n log n) |  |  |  |
| **20. Which of the following formulas in Omega notation best represent the expression n²+35n+6?** | | | | **[** | **B** | **]** |
| A) Ω (n³) | B) Ω (n²) | C) Ω (n) | D) Ω (35) |  |  |  |

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| **1. You are given a Knapsack that can carry a maximum weight of 70. There are 4 items with weights {20, 30, 40, 70} and values {70, 80, 90, 200}. What is the maximum value of the items you can carry using the knapsack where the items cannot be partitioned? (0/1) Knapsack** | | | | **[** | **B** | **]** |
| A) 160 | B) 200 | C) 170 | D) 90 |  |  |  |
| **2. What is the time complexity of Floyd–Warshall algorithm to calculate all pair shortest path in a graph with n vertices?** | | | | **[** | **D** | **]** |
| A) O(n^2logn) | B) Theta(n^2logn) | C) Theta(n^4) | D) Theta(n^3) |  |  |  |
| **3. An all-pairs shortest-paths problem is efficiently solved using:** | | | | **[** | **D** | **]** |
| A) Dijkstra' algorithm | B) Bellman-Ford algorithm | C) Kruskal algorithm | D) Floyd-Warshall algorithm |  |  |  |
| **4. Which of the following is/are property/properties of a dynamic programming problem?** | | | | **[** | **D** | **]** |
| A) Optimal substructure | B) Overlapping subproblem | C) Greedy approach | D) Both A & B |  |  |  |
| **5. In dynamic programming, the technique of storing the previously calculated values is called** | | | | **[** | **C** | **]** |
| A) Saving value | B) Storing value | C) Memoization | D) Mapping |  |  |  |
| **6. When a top-down approach of dynamic programming is applied to a problem, it usually \_\_\_\_\_\_\_\_\_** | | | | **[** | **B** | **]** |
| A) Decreases both, the time complexity and the space complexity | B) Decreases the time complexity and increases the space complexity | C) Increases the time complexity and decreases the space complexity | D)Increases both, the time complexity and the space complexity |  |  |  |
| **7. Which of the following problems is NOT solved using dynamic programming?** | | | | **[** | **D** | **]** |
| A) 0/1 knapsack problem | B) Matrix chain multiplication problem | C) Edit distance problem | D) Fractional knapsack problem |  |  |  |
| **8. Which is not return optimal solution from the following methods** | | | | **[** | **B** | **]** |
| A) Dynamic programming | B) Backtracking | C) Branch and bound | D) Greedy method |  |  |  |
| **9. Graph Coloring is which type of algorithm design strategy** | | | | **[** | **B** | **]** |
| A) Dynamic programming | B) Backtracking | C) Branch and bound | D) Greedy method |  |  |  |
| **10. Breadth first search \_\_\_\_\_\_\_\_\_\_** | | | | **[** | **B** | **]** |
| A) Scans each incident node along with its children. | B) Scans all incident edges before moving to other node. | C) Is same as backtracking | D) Scans nodes in random order |  |  |  |
| **11. Name the node which has been generated but none of its children nodes have been generated** | | | | **[** | **B** | **]** |
| A) Dead node | B) Live node | C) E-Node | D) State Node |  |  |  |
| **12. A round trip path along n edges of G that visits every vertex once and returns to its starting position** | | | | **[** | **B** | **]** |
| A) MST | B) TSP | C) Multistage Graph | D) Hamiltonian Cycle |  |  |  |
| **13. The optimal solution to a problem is a combination of optimal solutions of its sub problems is** | | | | **[** | **C** | **]** |
| A) Principle of Duality | B) Principle of Feasibility | C) Principle of Optimality | D) Principle of Dynamicity |  |  |  |
| **14. How many nodes are there in a full state space tree with n = 6? (n is no of levels, & root is at level 1)** | | | | **[** | **C** | **]** |
| A) 65 | B) 64 | C) 63 | D) 32 |  |  |  |
| **15. In which of the following cases n-queen problem does not exist** | | | | **[** | **C** | **]** |
| A) n=2 and n=4 | B) n=4 and n=6 | C) n=2 and n=3 | D) n=4 and n=8 |  |  |  |
| **16. What is the type of the algorithm used in solving the 8 Queens problem?** | | | | **[** | **A** | **]** |
| A) Backtracking | B) Dynamic | C) Branch and Bound | D) All |  |  |  |
| **17. \_\_\_\_\_\_ Search is the best method to go for the game playing problem?** | | | | **[** | **D** | **]** |
| A) Optimal | B) Stratified | C) Random Search | D) Heuristic |  |  |  |
| **18. The name backtrack was first coined by \_\_\_\_\_\_\_\_\_** | | | | **[** | **A** | **]** |
| A) D.H.Lehmer | B) L.Baumert | C) R.J.Walker | D) S. Golomb |  |  |  |
| **19. If a problem can be solved by combining optimal solutions to non-overlapping problems, the strategy is called \_\_\_\_\_\_\_\_\_\_\_\_\_** | | | | **[** | **A** | **]** |
| A) Dynamic programming | B) Greedy | C) Divide and conquer | D) Recursion |  |  |  |
| **20. Floyd-Warshall algorithm utilizes \_\_\_\_\_\_\_\_\_\_ to solve the all-pairs shortest paths problem on a directed graph in \_\_\_\_\_\_\_\_\_\_ time.** | | | | **[** | **C** | **]** |
| A) Greedy algorithm, O(V3) | B) Greedy algorithm, O (V2lgn) | C)Dynamic programming, O(V3) | D)Dynamic programming,O(V2) |  |  |  |