SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Ramapuram Campus, Bharathi Salai, Ramapuram, Chennai - 600089

**FACULTY OF ENGINEERING AND TECHNOLOGY**

# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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**QUESTION BANK**

DEGREE / BRANCH: B.Tech/CSE

IV SEMESTER

**18CSC204J – Design and Analysis of Algorithms**

Regulation – 2018

Academic Year 2021-2022

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**QUESTION BANK**

**SUBJECT : 18CSC204J – Design and Analysis of Algorithms**

**SEM/ YEAR: IV/ II**

**Course Outcomes**

**CO1:** Apply efficient algorithms to reduce space and time complexity of both recurrent and non-recurrent relations

**CO2:** Solve problems using divide and conquer approaches

**CO3:** Apply greedy and dynamic programming types techniques to solve polynomial time problems.

**CO4:** Create exponential problems using backtracking and branch and bound approaches.

**CO5:** Interpret various approximation algorithms and interpret solutions to evaluate P type, NP Type, NPC, NP Hard problems

**CO6:** Create algorithms that are efficient in space and time complexities by using divide conquer, greedy, backtracking technique

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| **UNIT III** | | | |
| **Introduction-Greedy and Dynamic Programming, Examples of problems that can be solved by using greedy and dynamic approach Huffman coding using greedy approach, Comparison of brute force and Huffman method of encoding Knapsack problem using greedy approach, Complexity derivation of knapsack using greedy Tree traversals, Minimum spanning tree - greedy, Kruskal's algorithm - greedy Minimum spanning tree - Prim's algorithm, Introduction to dynamic programming 0/1 knapsack problem, Complexity calculation of knapsack problem Matrix chain multiplication using dynamic programming, Complexity of matrix chain multiplication Longest common subsequence using dynamic programming, Explanation of LCS with an example Optimal binary search tree (OBST)using dynamic programming, Explanation of OBST with an example** | | | |
| **PART-A (Multiple Choice Questions)** | | | |
| **Q.**  **No** | **Questions** | **Course Outcome** | **Competence**  **BT Level** |
| **1** | ------------- is a Boolean-valued function that determines whether x can be included into the solution vector   1. Overlapping subproblems 2. Fleasible solution 3. Memoization 4. Greedy   **ANSWER: B** | CO 2 | BT 1 |
| **2** | Trees with edge with weights are called ------------   1. weighted tree 2. unweighted tree 3. bruteforce 4. Greedy   **ANSWER: A** | CO 2 | BT 1 |
| **3** | ---------------- is to determine an optimal placement of booster   1. Weighted tree 2. Vertex 3. Tree Vertex Splitting Problem (TVSP) 4. Greedy   **ANSWER: C** | CO 2 | BT 1 |
| **4** | The order in which TVS visits that computes the delay values of the nodes of the tree is called the---------------.   1. Treeorder 2. Inorder 3. Preorder 4. postorder   **ANSWER: D** | CO 2 | BT 1 |
| **5** | Algorithm TVS takes ------------ time, where n is the number f nodes in the tree  \_\_\_\_\_\_\_\_\_\_  A. O (N)  B. O (logn)  C. O (n2)  D. O (n logn)  **ANSWER: A** | CO 2 | BT 1 |
| **6** | ------------ is a greedy method to obtain a minimum-cost spanning tree builds this tree edge by edge  a)Prism’s algorithm  b)Dynamic algorithm  c)Greedy algorithm  d)Dynamic algorithm  **ANSWER: A** | CO 2 | BT 1 |
| **7** | Two sorted files containing n and m records respectively could be merged together to obtain one sorted file in time ------------.   1. Ω( n log n) 2. O(n+m) 3. O (n2log n) 4. O( n log n)   **ANSWER: B** | CO 2 | BT 1 |
| **8** | Which of the following is an external sorting? A. Insertion Sort B. Bubble Sort C. Merge Sort D. Tree Sort  **ANSWER: B** | CO 2 | BT 1 |
| **9** | The two-way merge pattern scan be represented by------------   1. Weighted tree 2. Vertex 3. binary merge tree 4. Greedy   **ANSWER: C** | CO 2 | BT 1 |
| **10** | What algorithm technique is used in the implementation of Kruskal solution for the MST?   1. greedy technique 2. divide-and-conquer technique 3. dynamic programming technique 4. the algorithm combines more than one of the above techniques   **ANSWER: A** | CO 2 | BT 1 |
| **11** | The function Tree of Algorithm uses the ------- stated to obtain a two-way merge tree for n file   1. divide-and-conquer technique 2. greedy rule 3. dynamic programming technique 4. the algorithm combines more than one of the above techniques   **ANSWER: B** | CO 2 | BT 1 |
| **12** | A decode tree is a-------------- in which external nodes represent messages.   1. minimum spanning tree 2. B tree 3. binary tree 4. AVL tree   **ANSWER: C** | CO 2 | BT 1 |
| **13** | The -------------in the code word for a message determine the branching needed at each level of the decode tree to reach the correct external node.   1. binary bits 2. decoder 3. encoder 4. binary bytes   **ANSWER: A** | CO 2 | BT 1 |
| **14** | The cost of decoding a --------is proportional to the number of bits in the code   1. binary bits 2. code word 3. data 4. binary bytes   **ANSWER: B** | CO 2 | BT 1 |
| **15** | Which one of the following sorting algorithm is best suited to sort an array of 1 million elements? a) Bubble sort b) Insertion sort c) Merge sort d) Quick sort  **ANSWER: D** | CO 2 | BT 1 |
| **16** | What is the edges on the shortest paths from a vertex v to all remaining vertices in a connected undirected graph G form a spanning tree of G is called?   1. MST 2. shortest-path spanning tree 3. binary tree 4. AVL tree   **ANSWER: B** | CO 2 | BT 1 |
| **17** | ---------------is an algorithm design method that can be used when the solution to a problem can be viewed as the result of a sequence of decisions.   1. Dynamic Programming 2. Greedy method 3. Huffman coding 4. Tree traversal   **ANSWER: A** | CO 2 | BT 1 |
| **18** | --------- often drastically reduces the amount of enumeration by avoiding the enumeration of some decision sequences that cannot possibly be optimal.   1. Dynamic Programming 2. Greedy method 3. Huffman coding 4. Tree traversal   **ANSWER: A** | CO 2 | BT 1 |
| **19** | In the ----------------only one decision sequence is ever generated.   1. Dynamic Programming 2. Greedy method 3. Huffman coding 4. Tree traversal   **ANSWER: B** | CO 2 | BT 1 |
| **20** | Dynamic programming algorithms solve the-------------- to obtain a solution to the given problem instance   1. Optimistic 2. Greedy method 3. Huffman coding 4. recurrence   **ANSWER: D** | CO 2 | BT 1 |
| **21** | A dynamic programming formulation for a k-stage graph problem is obtained by first noticing that every s to t path is the result of a sequence of ----------- decision.   1. k 2. k-1 3. k-2 4. 2k   **ANSWER: C** | CO 2 | BT 1 |
| **22** | Which of the following problems is NOT solved using dynamic programming?   1. 0/1 knapsack problem 2. Matrix chain multiplication problem 3. Edit distance problem 4. Fractional knapsack problem   **ANSWER: D** | CO 2 | BT 1 |
| **23** | The problem of ---------is to identify a minimum-cost sequence of edit operations that will transform X into Y.   1. 0/1 knapsack problem 2. Matrix chain multiplication problem 3. Edit distance problem 4. string editing   **ANSWER: D** | CO 2 | BT 1 |
| **24** | In Knapsack problem, the best strategy to get the optimal solution, where Pi, Wi is the Profit, Weight associated with each of the Xith object respectively is to   1. Arrange the values Pi/Wi in ascending order 2. Arrange the values Pi/Xi in ascending order 3. Arrange the values Pi/Wiin descending order 4. **)**Arrange the values Pi/Xiin escending order   **ANSWER: D** | CO 2 | BT 1 |
| **25** | In Huffman coding, data in a tree always occur?   1. Roots 2. Leaves 3. left sub trees 4. right sub trees   **ANSWER: B** | CO 2 | BT 1 |
| **PART B (4 Marks)** | | | |
| **1** | Discuss the components of Greedy Algorithm | CO2 | BT 3 |
| **2** | Compare Greedy technique with dynamic programming and divide and compare. | CO2 | BT 3 |
| **3** | Draw the Characteristics of a good software design | CO2 | BT 3 |
| **4** | What is brute force algorithm? List the strength and weakness of brute force algorithm. | CO2 | BT 3 |
| **5** | What is the general divide-and-conquer recurrence relation? | CO2 | BT 2 |
| **6** | Write the difference between the Greedy method and Dynamic programming. | CO2 | BT 2 |
| **7** | What are the labels in Prim’s algorithm used for? | CO2 | BT 2 |
| **8** | Explain Kruskal’s algorithm of greedy method? | CO2 | BT 3 |
| **PART C (12 Marks)** | | | |
| **1** | Explain in detail about greedy knapsack problem. Find an optimal solution to the knapsack instance n=7,m=15,(P1,P2,P3,P4,P5,P6,P7)=(10,5,15,7,6,18,3) and (W1,W2,W3,W4,W5,W6,W7)= (2,3,5,7,1,4,1) | CO2 | BT 4 |
| **2** | Write dynamic programming solution for the travelling salesperson problem for the network with the cost adjacency matrix | CO2 | BT 4 |
| **3** | Explain in detail about Huffman code algorithm. Let A={a/5,d/5,c/12,d/13,e/16,f/45} be the letters and its frequency distribution in a text file. Compute a suitable Huffman coding to compress the data effectively and also compute optimal cost. | CO2 | BT 4 |
| **4** | Write an algorithm to determine the sum of subsets for a given sum and a set of numbers. Draw the tree representation to solve the subset sum problem given the number set as {5,10,15,20,25} with the sum=30. Draw all the subsets. | CO2 | BT 4 |
| **5** | Explain in detail about knapsack problem. | CO2 | BT 4 |

**Note:**

1. **BT Level –** Blooms Taxonomy Level
2. **CO – Course Outcomes**

BT1 – Remember BT2 – Understand BT3 – Apply BT4 – Analyze BT5 – Evaluate BT6 – Create