

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2021****Subject Code:3150703****Date:17/12/2021****Subject Name:Analysis and Design of Algorithms****Time:02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

- Q.1**
- |     |  |           |
|-----|--|-----------|
| (a) | Define algorithm. Discuss key characteristics of algorithms.   | <b>03</b> |
| (b) | Explain why analysis of algorithms is important? Explain: Worst Case, Best Case and Average Case Complexity with suitable example. | <b>04</b> |
| (c) | Write and analyze an insertion sort algorithm to arrange n items into ascending order.   | <b>07</b> |

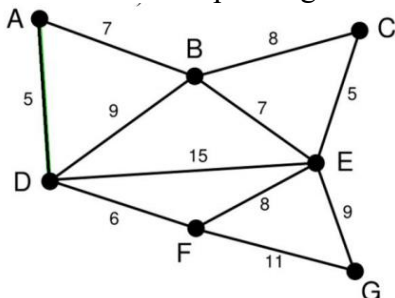
- Q.2**
- |     |  |           |
|-----|--|-----------|
| (a) | Write an algorithm of Selection Sort Method.   | <b>03</b> |
| (b) | Sort the following numbers using heap sort.<br>20, 10, 50, 40, 30  | <b>04</b> |
| (c) | Sort the following list using quick sort algorithm: <50, 40, 20, 60, 80, 100, 45, 70, 105, 30, 90, 75> Also discuss worst and best case of quick sort algorithm. | <b>07</b> |

**OR**

- |     |   |           |
|-----|---|-----------|
| (c) | Apply merge sort algorithm on array A = {2,7,3,5,1,9,4,8}. What is time complexity of merge sort in worst case? | <b>07</b> |
|-----|---|-----------|
- Q.3**
- |     |  |           |
|-----|--|-----------|
| (a) | What is Principle of Optimality? Explain its use in Dynamic Programming Method   | <b>03</b> |
| (b) | Explain Binomial Coefficient algorithm using dynamic programming.  | <b>04</b> |
| (c) | Solve the following 0/1 Knapsack Problem using Dynamic Programming. There are five items whose weights and values are given in following arrays. Weight $w [] = \{1,2,5,6,7\}$ Value $v [] = \{1, 6, 18, 22, 28\}$ Show your equation and find out the optimal knapsack items for weight capacity of 11 units. | <b>07</b> |

**OR**

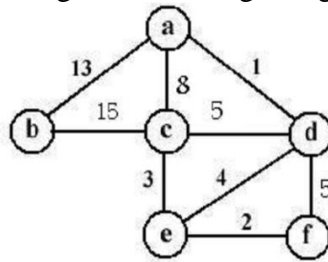
- Q.3**
- |     |   |           |
|-----|---|-----------|
| (a) | Compare Dynamic Programming Technique with Greedy Algorithms                                      | <b>03</b> |
| (b) | Give the characteristics of Greedy Algorithms.  | <b>04</b> |
| (c) | Obtain longest common subsequence using dynamic programming. Given A = "acabaca" and B = "bacac". | <b>07</b> |
- Q.4**
- |     |  |           |
|-----|--|-----------|
| (a) | Using greedy algorithm find an optimal schedule for following jobs with n=7 profits: (P1, P2, P3, P4, P5, P6, P7) = (3, 5, 18, 20, 6, 1, 38) and deadline (d1, d2, d3, d4, d5, d6, d7) = (1, 3, 3, 4, 1, 2, 1) | <b>03</b> |
| (b) | Find Minimum Spanning Tree for the given graph using Prim's Algo.  | <b>04</b> |



- (c) Explain in brief Breadth First Search and Depth First Search Traversal techniques of a Graph with Example. **07**

**OR**

- Q.4** (a) Find an optimal Huffman code for the following set of frequency. A : 50, b: 20, c: 15, d: 30 **03**  
 (b) Find Minimum Spanning Tree for the given graph using Kruskal Algo. **04**



- (c) Explain Backtracking Method. What is N-Queens Problem? Give solution of 4- Queens Problem using Backtracking Method **07**

- Q.5** (a) Define Articulation point, Acyclic Directed Graph, Back Edge **03**  
 (b) Show the comparisons that naïve string matcher makes for the pattern  $p=0001$  in the text  $T=000010001010001$  **04**  
 (c) Explain spurious hits in Rabin-Karp string matching algorithm with example. Working modulo  $q=13$ , how many spurious hits does the Rabin-Karp matcher encounter in the text  $T = 2359023141526739921$  when looking for the pattern  $P = 31415$ ? **07**

**OR**

- Q.5** (a) Explain polynomial reduction. **03**  
 (b) Differentiate branch and bound and back tracking algorithm. **04**  
 (c) Explain P, NP, NP complete and NP-Hard problems. Give examples of each **07**

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