

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2020****Subject Code:3150703****Date:29/01/2021****Subject Name:Analysis & Design of Algorithms****Time:10:30 AM TO 12:30 PM****Total Marks: 56****Instructions:**

1. Attempt any **FOUR** questions out of **EIGHT** questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

|            |  | <b>MARKS</b> |
|------------|--|--------------|
| <b>Q.1</b> | (a) What is an algorithm? Why analysis of algorithm is required?   | <b>03</b>    |
|            | (b) What is asymptotic notation? Find out big-oh notation of the $f(n) = 3n^2 + 5n + 10$                                   | <b>04</b>    |
|            | (c) Write an algorithm for insertion sort. Analyze insertion sort algorithm for best case and worst case.                  | <b>07</b>    |
| <b>Q.2</b> | (a) What is the difference between selection sort and bubble sort?   | <b>03</b>    |
|            | (b) Write iterative and recursive algorithm for finding the factorial of N. Derive the time complexity of both algorithms. | <b>04</b>    |
|            | (c) Solve following recurrence relation using iterative method<br>$T(n) = 2T(n/2) + n$                                     | <b>07</b>    |
| <b>Q.3</b> | (a) How divide and conquer approach work?  | <b>03</b>    |
|            | (b) Trace the quick sort for data $A = \{6, 5, 3, 11, 10, 4, 7, 9\}$   | <b>04</b>    |
|            | (c) Explain master theorem and solve the recurrence $T(n) = 9T(n/3) + n$ with master method                                | <b>07</b>    |
| <b>Q.4</b> | (a) Write the characteristics of greedy algorithm.   | <b>03</b>    |
|            | (b) Trace the merge sort for data $A = \{6, 5, 3, 11, 10, 4, 7, 9\}$   | <b>04</b>    |
|            | (c) Find minimum spanning tree for the given graph in fig-1 using prim's algorithm   | <b>07</b>    |

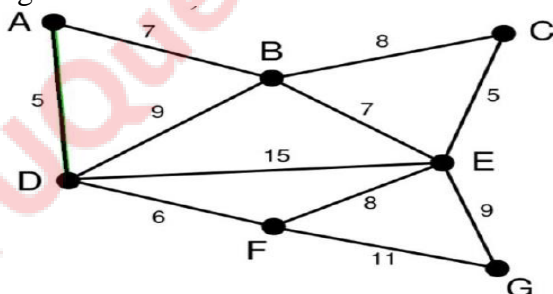


Fig-1

|            |   |           |
|------------|---|-----------|
| <b>Q.5</b> | (a) How huffman code is memory efficient compare to fixed length code?  | <b>03</b> |
|            | (b) Give difference between greedy approach and dynamic programming.  | <b>04</b> |
|            | (c) Find the Huffman code for each symbol in following text<br>ABCCDEBABFFBACBEBDFAAAABCDEEDCCBFEBFCAE  | <b>07</b> |
| <b>Q.6</b> | (a) What is principal of optimality? Explain its use in Dynamic Programming Method.   | <b>03</b> |
|            | (b) Find out minimum number of multiplications required for multiplying:<br>$A[1 \times 5]$ , $B[5 \times 4]$ , $C[4 \times 3]$ , $D[3 \times 2]$ , and $E[2 \times 1]$ . | <b>04</b> |
|            | (c) Solve following knapsack problem using dynamic programming algorithm with given capacity $W=5$ , Weight and Value are as follows :                                    | <b>07</b> |

(2,12),(1,10),(3,20),(2,15)

- Q.7** (a) What is finite automata? How it can be used in string matching? **03**  
(b) Differentiate BFS and DFS **04**  
(c) Explain Backtracking Method. What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method. **07**
- Q.8** (a) Explain Minimax principal. **03**  
(b) Define P, NP, NP-complete, NP-Hard problems. **04**  
(c) Explain rabin-karp string matching algorithm. **07**

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