# BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)

## Term-End Examination

## June, 2022

### BCS-042 : INTRODUCTION TO ALGORITHM DESIGN

*Time : 2 hours*                    *Maximum Marks : 50*

**Note :** *Question no.* **1** *is* **compulsory** *and carries 20 marks. Answer any* **three** *questions from the rest.*

1. (a) Define basic efficiency classes in context of running time. *3*

   (b) Perform linear and binary search to find 15 in a given list of numbers as below :

       5  7  9  12  13  15  21  25

   Count the number of comparisons in both the search methods. *6*

   (c) Define a recurrence relation. Draw a recurrence tree for the following recurrence relation : *5*

   $$T(n) = 2T(n/2) + 1$$

(d) Apply Kruskal's algorithm to find out the minimum cost spanning tree. 6
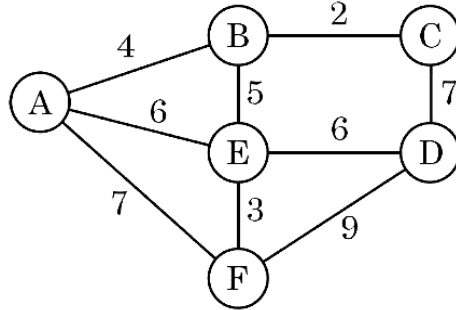


Starting vertex is A.

**2.** (a) Arrange the following functions in increasing order : 2

$$\log_2^n, \ n\log^n n^2, \ 5n + 7$$

(b) List any two applications of BFS/DFS. 2

(c) Write the algorithm for left to right binary exponentiation evaluation and apply the algorithm for evaluating $a^{280}$. Show all the steps. 6

**3.** (a) For the function defined by
$$f(n) = 6n^2 + 8n + 6,$$
show that $f(n) = O(n^2)$. 4

(b) Show that Dijkstra's algorithm may not work if edges can have negative weight. 3

(c) Traverse the complete graph on four vertices using BFS and write the sequence of vertices that would be visited by the graph traversal algorithm. 3

**4.** (a) Write a recurrence relation for Fibonacci series problem. *3*

(b) Write and apply Mergesort algorithm to sort the following list of integer numbers. Show all the intermediate steps. *7*

15, 8, 7, 4, 25, 30, 5, 13

**5.** (a) Write any two cases of the Master method with formal notations. *4*

(b) Write recurrence relations for matrix multiplication using Strassen's method and solve it using the Master method. *6*

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