

**BACHELOR OF COMPUTER
APPLICATIONS (BCA)
(Revised)**

Term-End Examination

June, 2023

**BCS-042 : INTRODUCTION TO
ALGORITHM DESIGN**

Time : 2 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory.*

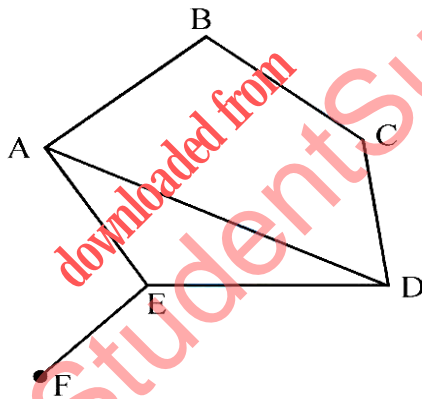
(ii) *Answer any **three** questions from the rest.*

1. (a) What is complexity of algorithm ? Explain space complexity and time complexity of algorithms with the help of example. 5
- (b) Write linear search algorithm and do analysis of this algorithm for best case and worst case. 5

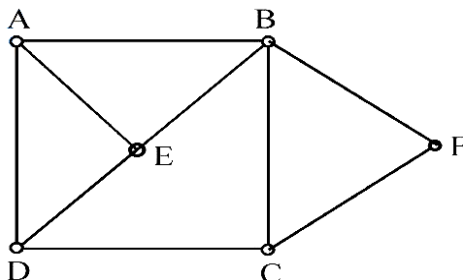
- (c) Using mathematical induction method, show that for all positive integers n :

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

- (d) What is Adjacency matrix ? Write adjacency matrix for the following graph :



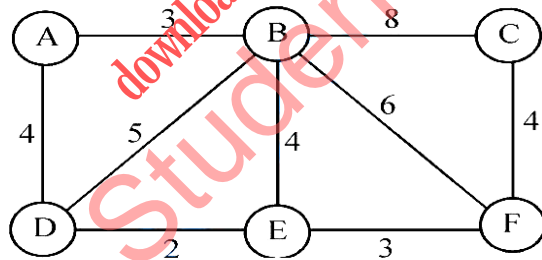
2. (a) Write Depth-First Search (DFS) algorithm. Also traverse the following graph using DFS from node A. 7



- (b) Solve the following recurrence relation using recurrence tree method : 3

$$T(n) = 4T\left(\frac{n}{2}\right) + n$$

3. (a) Write Kruskal's algorithm for finding Minimum Cost Spanning Tree (MCST). Find MCST of the following graph using Kruskal's algorithm. 8



- (b) Explain use of Big oh (O) notation in the analysis of algorithms with example. 2
4. (a) Find the optimal solution to the knapsack (fractional) problem for $n = 5$ and $m = 10$, where n is the number of objects and m is the capacity of the knapsack.

Profit and weight of each object are given below : 6

$$(P_1, P_2, P_3, P_4, P_5) = (10, 30, 35, 20, 40)$$

$$(W_1, W_2, W_3, W_4, W_5) = (3, 5, 2, 6, 11)$$

- (b) In context of algorithm study, explain the following with the help of an example of each : 4
- (i) Upper Bound
 - (ii) Backtracking
5. (a) Sort the following list using Bubble sort algorithm. Show the steps of sorting : 6
30, 8, 7, 14, 20, 28, 10, 6
- (b) Write algorithm for adding two matrices of order $m \times n$ and find its time complexity. 4