

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

Term-End Examination

December, 2024

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

Time : 2 Hours

Maximum Marks : 50

Note : (i) *Question No. 1 is compulsory and carries 20 marks.*

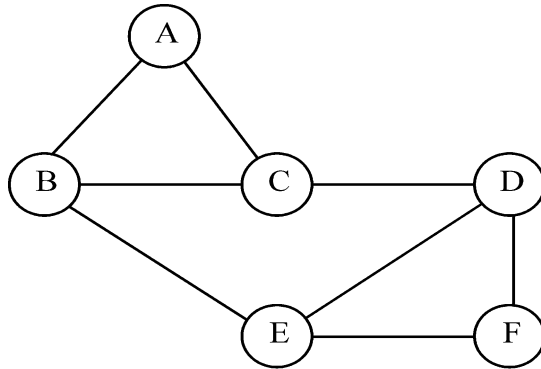
(ii) *Answer any **three** questions from the rest.*

1. (a) Define O (big oh) notation and prove or disprove the following using the basic definition of O (big oh) : 4

$$5n^3 + 2n^2 + 8 = O(n^3)$$

- (b) Write bubble sort algorithm and find its worst case time complexity. 5

- (c) What is connected-graph ? Explain with the help of an example. 2
- (d) Write adjacency list and adjacency matrix representation of the following graph : 5



- (e) Solve the following recurrence relation, using substitution method : 4

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

2. (a) Define the following terms : 2
- (i) Tree
 - (ii) Directed Graph
- (b) Write a recurrence relation for the recursive factorial function. 3
- (c) Explain the use of lower bound and upper bound concepts with the help of example. 5

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3. (a) Write Euclid's GCD algorithm. Also, find GCD (592, 252) using Euclid's algorithm. 5
- (b) Sort the following list using selection sort. Also, show all the intermediate steps in the process : 5

2, 10, 6, 18, 25, 9

4. (a) Define a fractional knapsack problem. Find the optimal solution to the following instance of a knapsack problem and show the stepwise running of the algorithm : 8

No. of objects = 5.

Capacity of a knapsack : $M = 18$
(P_1, P_2, \dots, P_7) = (12, 10, 8, 11, 14, 7, 9)

where P_i is a profit and

(W_1, W_2, \dots, W_7) = (4, 6, 5, 7, 2, 3, 6),

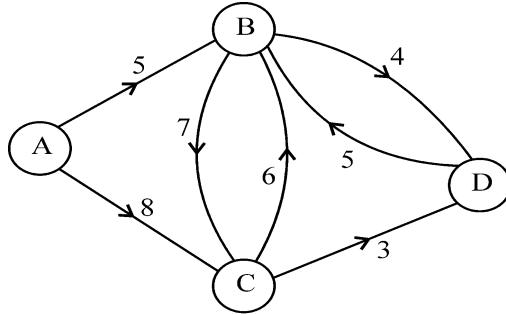
where W_i is a weight.

Each object has a profit P_i and weight W_i .

- (b) What is binary search ? 2

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5. Apply Dijkstra's algorithm to find the shortest path from source vertex A to each of the other vertices of the following directed graph : 10



Show all the steps of the solution.

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