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

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

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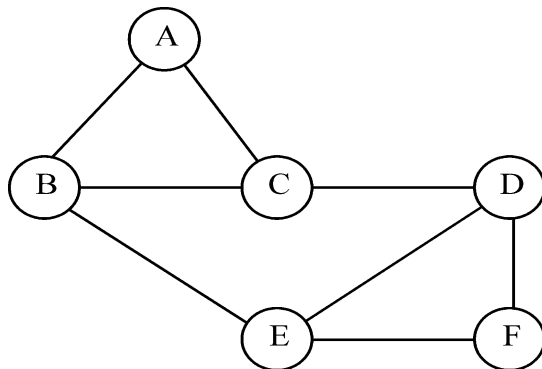
(e) Solve the following recurrence relation, using substitution method :   4

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

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

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
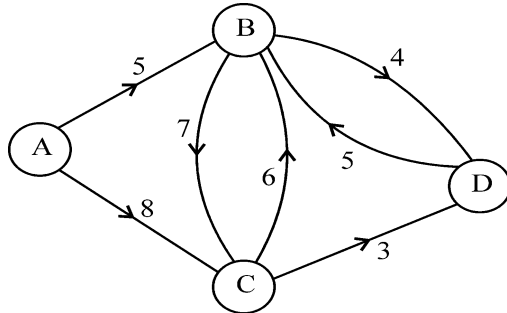$(P_1, P_2, \ldots, P_7) = (12, 10, 8, 11, 14, 7, 9)$

where P_i is a profit and

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

where W_i is a weight.

Each object has a profit P_i and weight W_i.

(b) What is binary search ? 2

5. Apply Dijkstra's algorithm to find the sortest 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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