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BCS–042

BACHELOR OF COMPUTER APPLICATIONS

(BCA)

Term-End Examination

December, 2025

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) Explain the concept of the space complexity in context of algorithm analysis. How is it different from time complexity ? Provide an example to illustrate the calculation of space complexity. 5

   (b) Given a list of distinct integers, write an algorithm to determine the position of an integer in the list using linear search and count the number of comparison operations required. 5

   (c) Describe any *three* of the following : 3×2=6

   (i) Greedy technique

   (ii) Cycle in a Directed Graph

   (iii) Upper Bound

   (iv) Branch and Bound

(d) Use Master Theorem to give tight asymptotic bounds of the following :

2×2=4

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

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

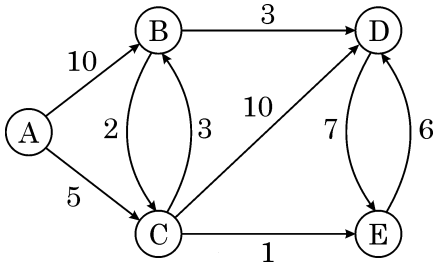
2. (a) State Euclid's algorithm and find GCD (595, 252) by this algorithm. 5

(b) Write the iterations for sorting the following list of numbers using bubble sort and selection sort : 5

45, 67, 13, 90, 2, 35, 28, 10

3. (a) Differentiate between Kruskal's algorithm and Prim's algorithm. 4

(b) Apply Dijkstra's algorithm to find shortest path from source vertex A to each of the other vertices of the following directed graph : 6



4. (a) Consider the following sorted array A with 13 elements :

7, 15, 19, 27, 30, 48, 56, 59, 75, 87, 94, 110, 111

Illustrate the working of Binary search algorithm while searching for ITEM : 5

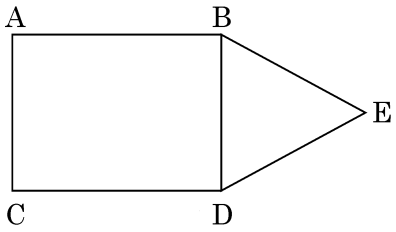
(i) 19

(ii) 94

(b) Show that the runtime of QUICK SORT algorithm in the best case is $\theta(n \log n)$. 5

5. (a) Multiply 1026732 × 0732920 using divide and conquer technique using Karatsuba method. 5

(b) Write an algorithm for Depth First Search (DFS) and traverse the following graph using DFS. Starting vertex is A : 5



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