Seat No. : _____

DB-103

December-2025

M.Sc. (CA & IT), Sem.-V

DSC-C-IMSCIT-352 T : Design and Analysis of Algorithm

Time : 2:00 Hours] **[Max. Marks : 50**

1. Answer the following :

   (A) What are asymptotic notations ? List and explain different asymptotic notations. **5**

   (B) What do you mean by analysing of algorithm ? What is best, worst and average case Analysis ? **5**

OR

1. (A) Explain recurrence relations in algorithm analysis. Why are recurrence relations important in divide-and-conquer algorithms ? Provide two examples and explain their meaning. **5**

   (B) Define algorithm. Explain different characteristics of an algorithm. **5**

2. Answer the following :

   (A) Describe the Quick Sort algorithm. Explain partitioning clearly and show step-by-step how quick sort sorts the array : [12, 7, 14, 9, 10]. **5**

   Mention best, worst, and average time complexities.

   (B) Compute the time complexity **5**

```
main ()
 {
     For(i=1; i<=n; i*2)
     {
          for(j=1;j<=n; j++)
          {
               y=y+1;
          }
     }
 }
```

OR

2. (A) Explain the Activity Selection Problem. Using the greedy approach, find the maximum number of activities for the following start-finish times : **5**

Start	1	3	0	5	8	5
Finish	2	4	6	7	9	9

(B) Explain Binary Search using Divide and Conquer. Show the step-by-step search process for the key 23 in the sorted array: [5, 12, 17, 23, 28, 34, 45]. Discuss its time complexity. **5**

3. Answer the following :

(A) Find the LCS of two sets S1={B, A, C, D, B} and S2= {B, D, C, B} using dynamic programming. Explain how you find it. **5**

(B) Describe the Fractional Knapsack problem. Show how the greedy method selects items based on profit/weight ratio for the following : **5**

Weights : 10, 20,30 Profits: 60, 100, 120 Knapsack Capacity = 50

OR

3. (A) What is a backtracking method in problem solving. Solve 4-Queen problem using backtracking ? **5**

(B) What is matrix chain multiplication ? Find out the minimum number of multiplication required for the multiplying matrices A[4*3] B[3*5] C[5*2] and D[2*3] **5**

4. Answer the following :

(A) Explain Dijkshtra's shortest path algorithm with an example. **5**

(B) Compare DFS and BFS algorithms. **5**

OR

4. (A) Write and explain Prim's algorithm with a example. **5**

(B) Explain the concept of NP- COMPLETE AND NP- HARD problem. **5**

5. Answer the following : (Any **two**)

(1) Solve the following recurrence relation using the substitution/iteration Method $T(n) = 2T(n/2) + n$. **5**

(2) Explain Huffman Coding. Construct a Huffman tree and compute codewords for the characters : **5**

A : 5, B : 9, C : 12, D : 13, E : 16, F : 45

(3) Write and explain minimum spanning tree using Krushkal's algorithm. **5**

(4) State and explain the master theorem for solving the recurrence function. **5**