# PSG COLLEGE OF ARTS & SCIENCE
## (AUTONOMOUS)

### MSc(SS) DEGREE EXAMINATION MAY 2025
(Fifth Semester)

Branch- SOFTWARE SYSTEMS(Five years Integrated)

## MAJOR ELECTIVE COURSE- I : DESIGN AND ANALYSIS OF ALGORITHMS

Time: Three Hours          Maximum: 50 Marks

### SECTION-A (5 Marks)
Answer ALL questions
ALL questions carry EQUAL marks       (5 x 1 = 5)

1   What type of rotation is required when a node is inserted into the left subtree of the left child in an AVL tree?
   (i) Left Rotation        (ii) Right Rotation
   (iii) Left-Right Rotation     (iv) Right-Left Rotation

2   Which tree structure is commonly used in databases for indexing?
   (i) AVL Tree          (ii) B-Tree
   (iii) Binary Search Tree     (iv) Splay Tree

3   Which algorithm finds the Minimum Spanning Tree using edge weights?
   (i) Kruskal's Algorithm      (ii) Dijkstra's Algorithm
   (iii) Bellman-Ford Algorithm   (iv) Floyd-Warshall Algorithm

4   Which problem is commonly solved using Dynamic Programming?
   (i) Shortest path in an unweighted graph    (ii) Binary Search
   (iii) Longest Common Subsequence       (iv) Merge Sort

5   Which problem is best solved using Branch and Bound?
   (i) Graph Coloring        (ii) DFS Traversal
   (iii) Merge Sort          (iv) 0/1 Knapsack Problem

### SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks      (5 x 3 = 15)

6 a) Explain the properties of an algorithm with example.

OR

b) What are the key operations performed on AVL trees?

7 a) Describe the indexed sequential access method in multiway trees.

OR

b) Give an account on M-way search tree.

8 a) Describe the role of binary search in Divide and Conquer.

OR

b) Explain Huffman coding with an example.

**Cont...**

9  a) Differentiate between polynomial and exponential time algorithms.

OR

b) Describe the All-Pairs Shortest Path problem with an example.

10  a) How does the State-Space Tree help in solving optimization problems?

OR

b) What is the difference between Backtracking and Branch & Bound?

## SECTION -C (30 Marks)
### Answer ALL questions
ALL questions carry EQUAL Marks          (5 x 6 = 30)

11 a) Elaborate Asymptotic analysis of an algorithm with an example.

OR

b) Differentiate between recursive and non-recursive algorithms.

12 a) Illustrate the process of insertion, searching, and splaying in a Splay Tree using an example. Analyze the amortized time complexity of these operations.

OR

b) Compare and contrast B-tree and B+ tree with an example.

13 a) Demonstrate the working of Strassen's Matrix Multiplication for two 2×2 matrices and compare its efficiency with the conventional method.

OR

b) Analyze the differences between Kruskal's and Prim's algorithms for finding the Minimum Spanning Tree (MST) in terms of time complexity, approach, and efficiency for dense and sparse graphs.

14 a) Solve the Traveling Salesman Problem (TSP) using Dynamic Programming for a given cost matrix and explain the steps involved.

OR

b) Discuss NP-hard and NP-complete problems with real-world examples.

15 a) Explain how the N-Queens problem is solved using Backtracking.

OR

b) Compare and contrast Hamiltonian Cycle and Eulerian Path.

Z-Z-Z                                    END