

2025

M.Tech. 1st Semester Examination
COMPUTER SCIENCE WITH AI

Paper : MCIC407X9

[Data Science and Algorithms Lab]

(Practical)

Full Marks : 50

Time : Three Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.

Group - A

(Data Science Lab)

Answer any *one* question on a lottery basis :

20×1=20

Write source code and input-output for each of the programs.

1. (i) Load a given dataset using Python (Pandas) and display its first and last five records.
- (ii) Read a CSV file and extract basic statistical information such as mean, median, and standard deviation.

10+10

P.T.O.

(2)

2. (i) Create a bar chart and a line chart using Matplotlib for a given dataset and interpret the results.
(ii) Visualize the distribution of a numerical variable using a histogram and box plot. 10+10

3. Import a dataset, split it into training and testing sets, and explain the purpose of data handling in model building.

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5. (i) Using NumPy, create a 2-D array and perform operations such as slicing, reshaping, mean, and standard deviation.
(ii) Load a dataset using Pandas and display its structure, data types, shape, and summary statistics. 10+10

(3)

6. (i) Identify missing values in a dataset and apply different **imputation techniques** (mean, median, mode).
- (ii) Perform **data preprocessing** by removing duplicates, renaming columns, and correcting data types.

10+10

7. Visualize data using **Matplotlib** by creating line charts, bar charts, and histograms.

8. (i) Perform element-wise mathematical operations (sqrt, power, log) on a NumPy array.
- (ii) Stack and split NumPy arrays vertically and horizontally.

10+10

9. Generate a correlation heatmap using Seaborn and interpret the results.

P.T.O.

10. Create scatter plots and pair plots to visualize relationships between features.
11. Generate pivot tables and charts to analyze business trends and prepare insights for decision-making.
12. Create dashboards using Matplotlib or Seaborn to summarize key business metrics (sales, revenue, etc.)

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(5)

Group - B

(Algorithm Lab)

Answer any *one* question on a lottery basis :

20×1=20

1. Write a program to implement Quicksort using divide-and-conquer approach. Test your program for average case and worst-case scenarios.

2. Implement a Binary Search Tree with the operations : insert, search, delete.

3. Write a program to implement Merge Sort using divide-and-conquer approach. Test your program for average case and worst-case scenarios.

4. Write a program to implement AVL Tree with separate functions for LL, RR, LR, and RL rotations.

P.T.O.

(6)

5. Implement any one of the graph traversal algorithms (BFS or DFS) and test your program using any graph having at least 10 vertices.

6. Implement both adjacency matrix and adjacency list representations of a graph.

7. Implement the Floyd-Warshall algorithm using dynamic programming approach.

8. Write a program to find the Minimum Spanning Tree (MST) of a connected weighted graph using Kruskal's/ Prim's algorithm.

9. Write a program to implement the 0/1 Knapsack Problem using dynamic programming approach.

(7)

10. Implement a program to solve N-Queens problem. Test the program for N=4 and N=8.

11. Implement a program to solve matrix-chain multiplication problem.

12. Write a program to implement heapsort with option to implement max-heap and min-heap.

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Viva-voce	3
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