



## **MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

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### **University Examinations 2024/2025**

**FIRST YEAR FIRST SEMESTER FOR THE DEGREE OF MASTER OF SCIENCE IN DATA SCIENCE**

#### **CCD 7101: INTERACTIVE PROGRAMMING**

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**DATE: JANUARY 2025**

**TIME: 3 HOURS**

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**INSTRUCTIONS: This exam is a practical, kindly, answer any three questions**

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#### **QUESTION ONE (20 MARKS)**

- a) Using a function named factorial, write a Python program to find the factorial of a given number using recursion (5 Marks)
- b) Define a function called finder. The function receives a list of integers and returns the smallest and largest number in it. The list of numbers should be entered by a user (5 Marks)
- c) Write a Python program to check if a given string is a palindrome. (5 Marks)
- d) Write a Python program to read a file, count the number of lines, words, and characters, and display the result (5 Marks)

#### **QUESTION TWO (20 MARKS)**

- a) Implement a Python class to simulate a stack data structure with push, pop, and display methods (10 Marks)
- b) Create a Python dictionary and write a program to sort the dictionary by keys and values (5 Marks)
- c) Write a Python program to implement the Bubble Sort algorithm. (5 Marks)

### **QUESTION THREE (20 MARKS)**

- a) Write a Python program to solve the Knapsack problem using a greedy approach. (10 Marks)
- b) Create a 3x3 NumPy array filled with random integers between 1 and 50. Find the maximum and minimum values along each row and column (5 Marks)
- c) Write a Python program using NurnPy to compute the dot product of two 2x2 matrices and verify the result (5 Marks)

### **QUESTION FOUR (20 MARKS)**

- a) Using NumPy, create an array of 20 equally spaced numbers between 1 and 100. Reshape the array into a 4x5 matrix and calculate the mean and standard deviation of each column (10 Marks)
- b) Create a Pandas Data Frame from a dictionary containing three columns: "Name", "Age", and "Salary". Perform the following operations: (10 Marks)
  - i. Add a new column "Bonus" which is 10% of the salary.
  - ii. Filter and display only the rows where the age is greater than 30.
  - iii. Input: A dictionary of Name, Age, and Salary.
  - iv. Output: Data Frame with "Bonus" column, filtered Data Frame based on age.

### **QUESTION FIVE (20 MARKS)**

- a) Using a Pandas Data Frame, load the tEST.csv dataset (or use a similar dataset) and perform the following tasks: (10 Marks)
  - i. Display the first 5 rows of the Data Frame.
  - ii. Find the total number of passengers who survived.
  - iii. Calculate the average age of passengers grouped by their class.
- b) Create a Pandas Data Frame with time series data for daily sales of a store for 7 days. Perform the following tasks: (10 Marks)
  - i. Set the date column as the index.
  - ii. Resample the data to show total sales for each 2-day period.
  - iii. Find the day with the maximum sales.