Fundamentals of Python Programming and Data Analysis

Part 1: Working with GPA

a. Generate a list of 20 floating-point values within a specified range.

b. Identify the two highest and two lowest values in the list.

c. Remove the highest and lowest values and compute the arithmetic mean of the resulting list.

d. Given a list of even length, exchange the first and second halves and display both the original and modified lists.

e. Perform steps a–d using the NumPy library.

Part 2: Working with Matrices

a. Construct a 5×5 array of random integers within a defined range and replace the third column with a constant value.

b. Generate a 4×4 array with sequential values and replace all diagonal elements with zero.

c. Create a 5×5 array and extract the border elements and the corner elements separately.

d. Normalize a 3×3 array by applying z-score normalization.

e. Replace all elements greater than a specified threshold in a 4×4 array using Boolean indexing.

f. Define a function to reverse a one-dimensional array and display both the original and reversed arrays.

Part 3: Monthly Temperature Analysis

a. Represent tabulated temperature data using NumPy arrays.

b. Compute the mean, maximum, and minimum temperatures for both columns over the dataset.

c. Determine the average values for the first and last quarters of the year.

d. Calculate the average monthly temperature using both the arithmetic mean function and a dot product operation.

Part 4: Student Grades Analysis

a. Generate a 20×3 array of random academic scores and compute the mean for each column and row.

b. Identify the maximum and minimum scores for each column.

c. Calculate the average scores for the first two and last two students.

d. Compute the average of the first two test scores for the first ten students.

e. Identify students who scored at least a defined threshold in either the second or third assessment.

f. Replace all scores below a specified threshold and compute the average scores for alternating students in selected columns.

g. Calculate the weighted total scores for a specified subset of students using given assessment weights.

h. Apply a defined percentage increase to the first two assessments and a decrease to the third, then display the updated results.

i. Normalize scores column-wise using max-based rescaling.