

# ASSIGNMENT-1

**Objective :** This assignment consists of various tasks to help you practice fundamental Python concepts, data analysis, and visualization techniques using NumPy, Pandas, and Matplotlib. Please solve each of the following problems:

## Question 1: Control Flow and Loops

Write a Python function to generate the first N Fibonacci numbers. Test the function with N = 10.

## Question 2: List and Dictionary Comprehension

Create a list of squares of numbers from 1 to 20 using list comprehension. Then, create a dictionary where the keys are numbers from 1 to 10, and the values are their cubes using dictionary comprehension.

## Question 3: File Handling

Write a Python script to create a CSV file named data.csv with three columns: Name, Age, and Score. Write at least five rows of data, then read the file and print the rows where the score is above 75.

## Question 4: Array Operations

Create a 1D NumPy array of 25 random integers between 10 and 100. Perform the following:

- Find the maximum, minimum, and their indices.
- Replace all odd numbers in the array with -1.

## Question 5: Matrix Manipulation

Create a 5x5 matrix with random numbers. Perform the following:

- Extract the diagonal elements.
- Calculate the sum of all elements above the main diagonal.

## Question 6: Statistical Functions

Generate a 3D NumPy array of shape (3, 4, 5) with random floats. Perform the following:

- Calculate the mean, median, and standard deviation of the entire array.
- Normalize the array by subtracting the mean and dividing by the standard deviation.

## Question 7: Broadcasting and Indexing

Create two 2D arrays of shape (4, 4) and (4, 1). Use broadcasting to add these arrays element-wise and display the result.

### Question 8: DataFrame Creation and Basic Operations

Create a Pandas DataFrame with three columns: Product, Price, and Quantity. Populate it with at least 8 rows. Perform the following:

- Calculate the total value for each product (Price × Quantity).
- Add a new column for the total value and sort the DataFrame by this column.

### Question 9: Data Filtering

Load the Titanic dataset from the Kaggle Titanic dataset or any publicly available source. Filter and display rows where:

- The passenger age is below 18.
- The passenger is female and survived.

### Question 10: Groupby Operations

Load the Iris dataset from Seaborn library or any other source like Kaggle, etc. Group the data by species and calculate the mean of petal length and sepal width for each group.

### Question 11: Handling Missing Values

Create a Pandas DataFrame with random data and intentionally introduce NaN values. Replace the NaN values with the column mean and display the updated DataFrame.

### Question 12: Merging DataFrames

Create two DataFrames: one with columns ID and Name, and another with columns ID and Score. Merge the two DataFrames on the ID column and display the resulting DataFrame.

### Question 13: Line Plot

Generate a random dataset representing the monthly revenue of a company. Plot a line graph to show the trend, and customize it with:

- A title, labeled axes, and a legend.

### Question 14: Bar Plot

Create a dataset representing the sales of five products in two different regions. Use a grouped bar chart to display the comparison between the regions for each product. Ensure that the plot is customized with:

- A title, labeled axes, and a legend.

### Question 15: Scatter Plot

Load the Iris dataset from Seaborn library or any other source like Kaggle, etc. Create a scatter plot comparing any two features of the flowers (e.g., petal length vs petal width, sepal length vs sepal width). Customize the plot to use different colors for each species and add labels and a title.