Experiment 18

Aim : - Creating and Manipulating Arrays*: Write a Python program to create a 1D, 2D, and 3D NumPy array. Perform basic operations like reshaping, slicing, and indexing.

Theory

1. NumPy Arrays

NumPy arrays are efficient multi-dimensional structures for numerical computations.

2. Creating Arrays

1D Array: A simple list-like structure.

2D Array: A matrix with rows and columns.

3D Array: A cube-like structure (depth, rows, columns).

3. Reshaping Arrays

Changes the shape without modifying data. Example:

reshaped = array_1d.reshape(2, 3)

4. Indexing & Slicing

Indexing: Access specific elements.

value = array_2d[1, 2] # Element at row 1, column 2

Slicing: Extract portions.

slice_1d = array_1d[:3] # First three elements

5. Applications

Used in data science, AI, image processing, and numerical simulations.

Algorithm:

Step 1: Import NumPy

Import the NumPy library to handle array operations.

Step 2: Create Arrays

Create a 1D array using np.array().

Create a 2D array as a list of lists.

Create a 3D array as a list of 2D lists.

Step 3: Reshape the Array

Use .reshape() to change the shape of the 1D array into 2D or 3D.

Step 4: Perform Indexing

Access specific elements using indices [row, column].

Access elements in a 3D array using [depth, row, column].

Step 5: Perform Slicing

Extract parts of the array using slicing (:) for rows and columns.

Step 6: Print Results

Display the original arrays, reshaped arrays, and results of indexing and slicing.

Code

```
array_1d = np.array([1, 2, 3, 4, 5])
array_2d = np.array([[1, 2, 3], [4, 5, 6]])
array_3d = np.array([[[1, 2], [3, 4]], [[5, 6], [7, 8]]])

# Reshaping 1D to 2D
reshaped_array = array_1d.reshape(5, 1)

# Slicing 2D array
sliced_array = array_2d[:2, :2]

# Indexing an element
indexed_element = array_2d[1, 2]

print("1D Array:", array_1d)
print("2D Array:", array_2d)
print("3D Array:", array_3d)
print("Reshaped 1D to 2D:", reshaped_array)
print("Sliced 2D Array:", sliced_array)
print("Indexed Element:", indexed_element)
```

Ouput