Viva Questions – Module 1

1. **What is NumPy?**

   - Stands for Numerical Python – Open Source Python Package
   - Used for performing scientific computations, mathematical and statistical operations
   - Can Create N-Diamensional array
   - Creates an ndarray object

2. **Differentiate between NumPy arrays and Python List**

Numpy Arrays	Python List
▪ Array elements are homogeneous by default ▪ Element-wise operation is possible. ▪ Elements of an array are stored contiguously in memory. ▪ Less Memory Consumption ▪ Less Execution Time	• The list can be homogeneous or heterogeneous. • Element-wise operation is not possible on the list. • Elements of a list need not be contiguous in memory. • More memory consumption • More Execution time

3. **Advantages of using Numpy Arrays Over Python Lists:**

   - Consumes less memory.
   - Fast as compared to the python List.
   - Convenient to use.
   - Numpy array has various functions, methods, and variables, to ease our task of matrix computation.

4. **What is meant by array slicing?**

   Array slicing is a technique used in programming to extract a portion or segment of an array or a matrix based on specified indices. The sliced portion is often referred to as a "slice." Slicing provides a way to access sub arrays without modifying the original array.

   General Syntax:

   array[start:end:step]

   - **start**: The index where the slice begins (inclusive). If omitted, it defaults to the beginning of the array.
   - **end**: The index where the slice ends (exclusive). If omitted, it defaults to the end of the array.
   - **step**: The interval between indices. If omitted, it defaults to 1.

5. **What are the concepts of matrix shape and reshaping in programming?**

   The **shape** of a matrix refers to its dimensions, which describe the number of rows and columns it has. A matrix with m rows and n columns, its shape is denoted as m×n.

   The shape of a matrix can be obtained using the '.shape' attribute. - **matrix.shape**

   Reshaping a Matrix

   Reshaping a matrix involves changing its dimensions while keeping the total number of elements constant.

   For example, a 2×3 matrix can be reshaped into a 3×2 matrix or a 1×6 matrix, as long as the total number of elements (in this case, 6) remains the same.

   In programming, this can be done using the '.reshape()'attribute

   reshaped_matrix=matrix.reshape(3,2)

6. **What is SVD?**

   Singular Value Decomposition (SVD) is a powerful mathematical technique used in linear algebra to decompose a matrix into three other matrices. It has numerous applications in areas such as signal processing, statistics, machine learning, and more.

   Given any real or complex matrix A of size m×n, the SVD of A is a factorization of the form:

   $A=U\Sigma V^T$

   Where:

   - U is an m×m orthogonal (or unitary) matrix. The columns of U are called the **left singular vectors** of A
   - Σ is an m×n diagonal matrix, with non-negative real numbers on the diagonal. These numbers are called the **singular values** of A, and they are usually arranged in descending order.
   - V is an n×n orthogonal (or unitary) matrix. The columns of V are called the **right singular vectors** of A.
   - V^T is the transpose of V