DATA SCIENCE & MACHINE LEARNING-LAB

CYCLE 2

1. Create a three dimensional array specifying float data type and print it.
2. Create a 2 dimensional array (2X3) with elements belonging to complex data type and print it. Also display
   a. the no: of rows and columns
   b. dimension of an array
   c. reshape the same array to 3X2
3. Familiarize with the functions to create
   a) an uninitialized array
   b) array with all elements as 1,
   c) all elements as 0
4. Create an one dimensional array using **arange** function containing 10 elements.
   Display
   a. First 4 elements
   b. Last 6 elements
   c. Elements from index 2 to 7
5. Create an 1D array with **arange** containing first 15 even numbers as elements
   a. Elements from index 2 to 8 with step 2(also demonstrate the same using slice function)
   b. Last 3 elements of the array using negative index
   c. Alternate elements of the array
   d. Display the last 3 alternate elements
6. Create a 2 Dimensional array with 4 rows and 4 columns.
   a. Display all elements excluding the first row
   b. Display all elements excluding the last column
   c. Display the elements of 1^{st} and 2^{nd} column in 2^{nd} and 3^{rd} row
   d. Display the elements of 2^{nd} and 3^{rd} column
   e. Display 2^{nd} and 3^{rd} element of 1^{st} row
   f. Display the elements from indices 4 to 10 in descending order(use –values)
7. Create two 2D arrays using array object and
   a. Add the 2 matrices and print it
   b. Subtract 2 matrices

c. Multiply the individual elements of matrix
d. Divide the elements of the matrices
e. Perform matrix multiplication
f. Display transpose of the matrix
g. Sum of diagonal elements of a matrix

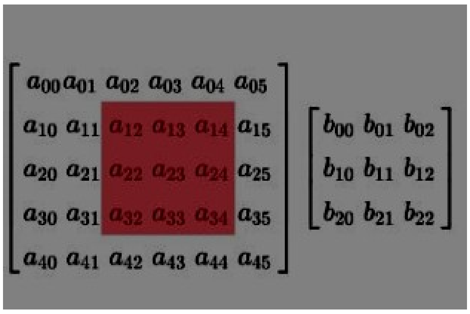
8. Demonstrate the use of insert() function in 1D and 2D array
9. Demonstrate the use of diag() function in 1D and 2D array.(use both square matrix and matrix with different dimensions)

10. Create a square matrix with random integer values(use randint()) and use appropriate functions to find:
    i) inverse
    ii) rank of matrix
    iii) Determinant
    iv) transform matrix into 1D array
    v) eigen values and vectors

11.. Create a matrix X with suitable rows and columns
    i) Display the cube of each element of the matrix using different
    methods(use multiply(), *, power(),**)
    ii) Display identity matrix of the given square matrix.
    iii) Display each element of the matrix to different powers.

11. Create a matrix Y with same dimension as X and perform the operation X^2+2Y

12. Define matrices A with dimension 5x6 and B with dimension 3x3. Extract a sub matrix of dimension 3x3 from A and multiply it with B**.** Replace the extracted sub matrix in A with the matrix obtained after multiplication



13. Given 3 Matrices A, B and C. Write a program to perform matrix multiplication of the 3 matrices.

14. Write a program to check whether given matrix is symmetric or Skew Symmetric.

15. Given a matrix-vector equation AX=b. Write a program to find out the value of X using **solve(),** given A and b as below

$X=A^{-1}b$.

$$A = \begin{bmatrix} 2 & 1 & -2 \\ 3 & 0 & 1 \\ 1 & 1 & -1 \end{bmatrix} \quad \mathbf{b} = \begin{bmatrix} -3 \\ 5 \\ -2 \end{bmatrix}$$

Note: Numpy provides a function called solve for solving such equations.

16. Write a program to perform the SVD of a given matrix A. Also reconstruct the given matrix from the 3 matrices obtained after performing SVD.

Use the function: **numpy.linalg.svd()**

Singular value Decomposition

Matrix decomposition, also known as matrix factorization, involves describing a given matrix using its constituent elements.

The Singular-Value Decomposition, or SVD for short, is a matrix decomposition method for reducing a matrix to its constituent parts in order to make certain subsequent matrix calculations simpler. This approach is commonly used in reducing the no: of attributes in the given data set.

The SVD of mxn matrix A is given by the formula $A = U\Sigma V^T$