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Subject Code: USCS405

Subject Name: Linear Algebra using Python

Practical – 1

Aim :- Write a program that demonstrates the following. i)

Addition of two complex numbers.

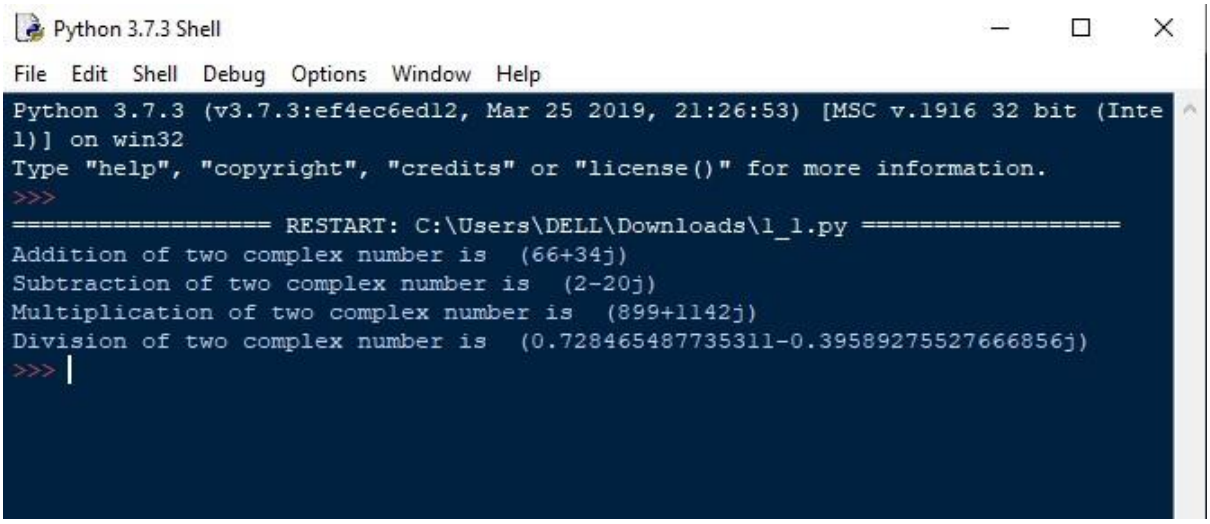
ii) Displaying the conjugate of a complex number. iii) Plotting a set of complex numbers. iv) Creating a new plot by rotating the given number by a degree 90 , 180 , 270 degrees and also by scaling by a number a = ½ , a = 1/3 , a = 2 etc.

Program Code :- i)

```
c1=34+7j c2=32+27j

print("Addition of two complex number is ", c1+c2) print("Subtraction of two complex number is ", c1-c2) print("Multiplication of two complex number is ", c1*c2) print("Division of two complex number is ", c1/c2)
```

Output:-



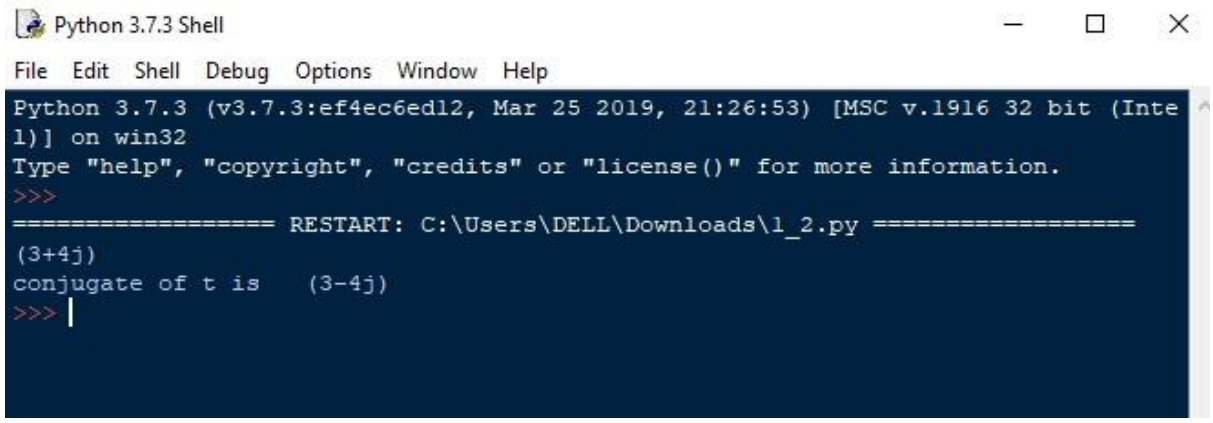
ii)

t=3+4j print(t)

m=t.conjugate()

print("conjugate of t is ",m)

Output:-



iii) import matplotlib.pyplot as plt

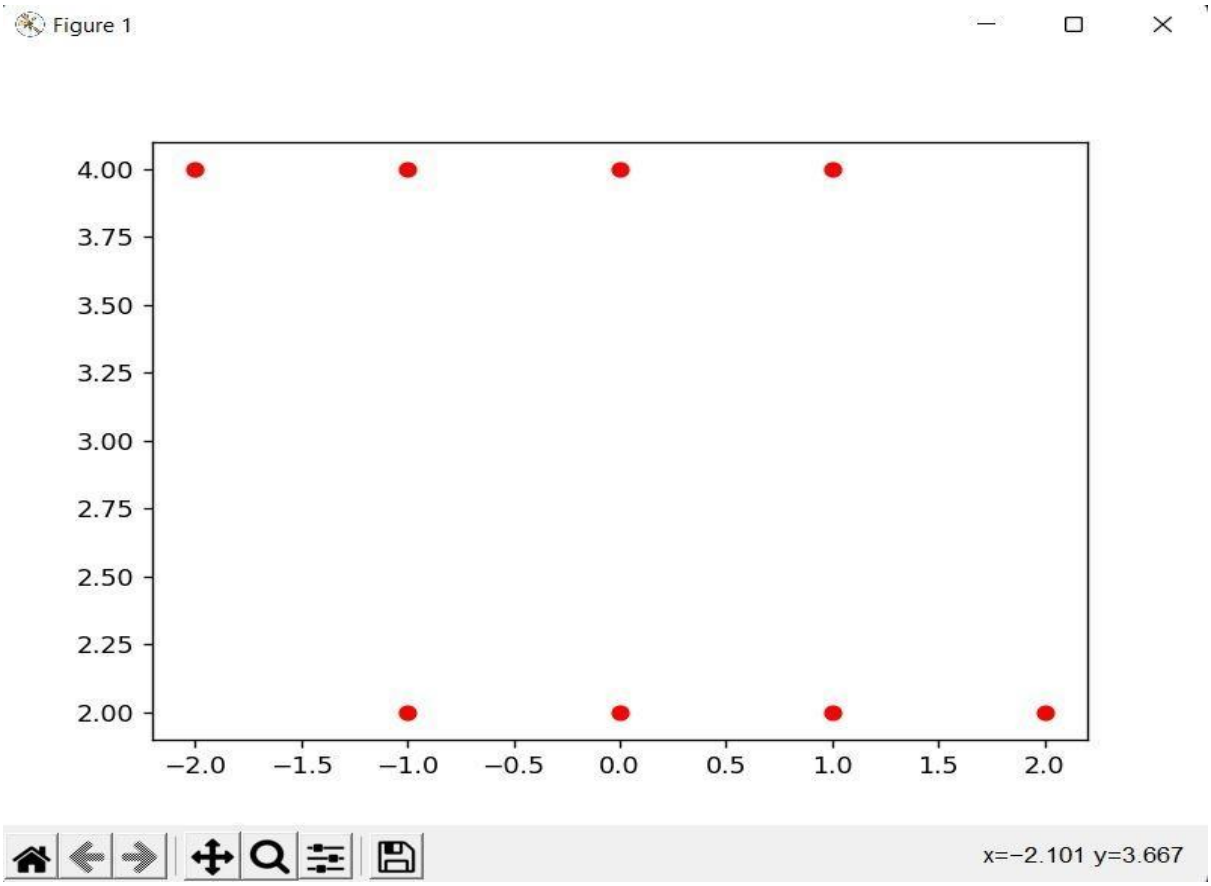
x=3+2j

a=[-2+4j,-1+2j,0+2j,1+2j,2+2j,-1+4j,0+4j,1+4j]

A=[x.real for x in a] B=[x.imag for x in a]

```
plt.scatter(A,B,color="red")
plt.show()
```

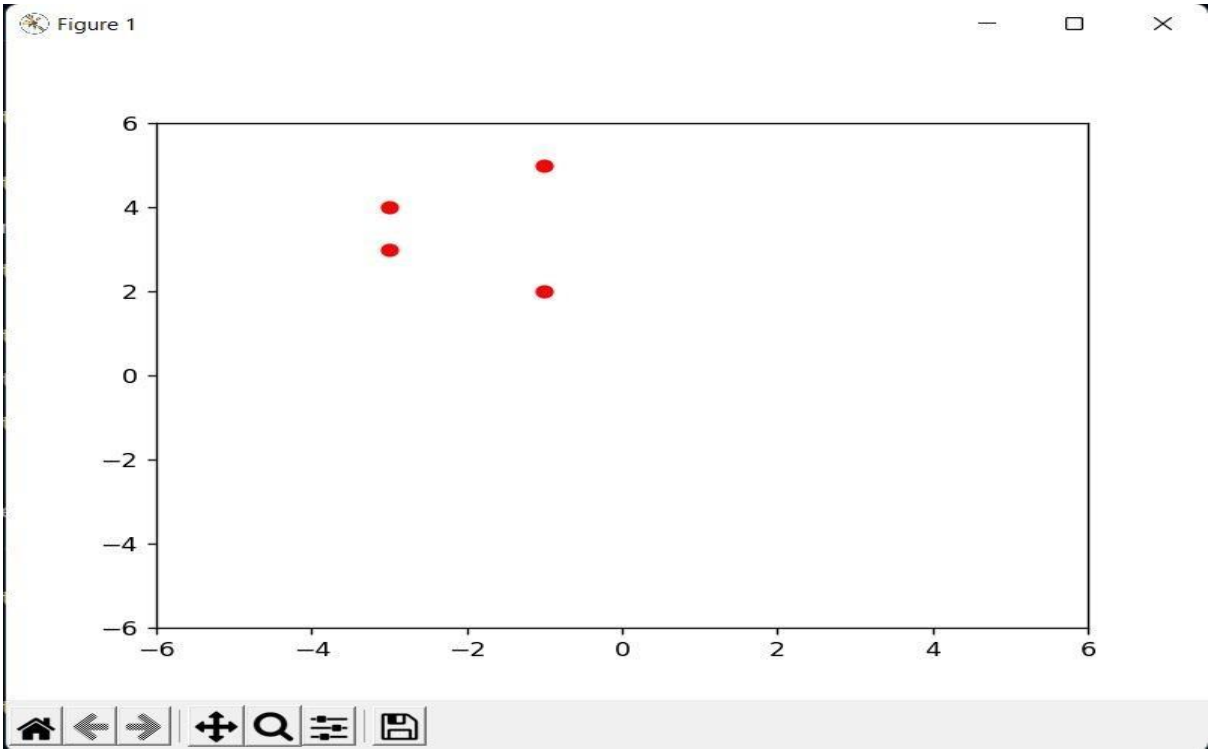
Output:-



iv)
```
import matplotlib.pyplot as plt
    s={3+3j,4+3j,2+1j,5+1j,2+1j}
    angle=int(input("Enter the angle rotation"))
    if angle==90:     s1={x*1j for x in s}
    print(s1)     x=[x.real for x in s1]
    y=[x.imag for x in s1]     plt.plot(x,y,'ro')
```

```
plt.axis([-6,6,-6,6])     plt.show() else:
print("invalid angle")
```

Output:-



Practical – 2

Aim:- Write a program to do the following:-

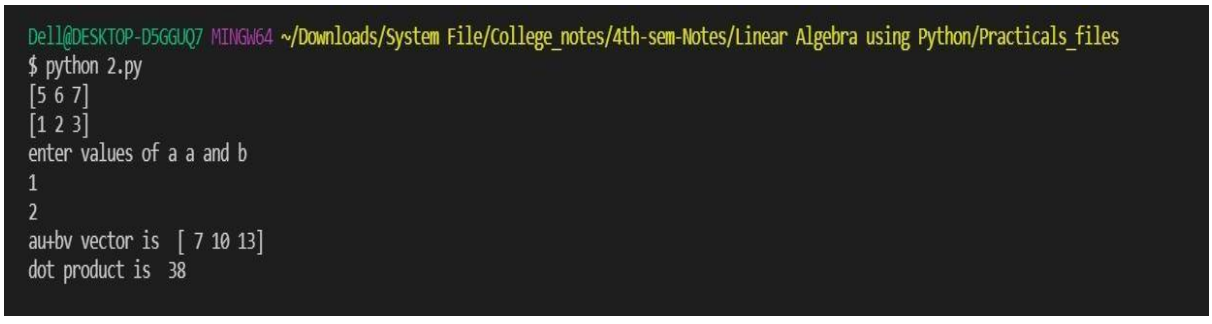
i) Enter a vector u as a n-list ii) Enter another vector v as a n-list

iii) Find the vector au+bv for different values of a and b iv) Find the dot product of u and v.

Program Code:-

```
import numpy as np
#enter vector as n-list
x=np.array([5,6,7])
y=np.array([1,2,3])
print(x) print(y)
print("enter values of
a a and b ")
a=int(input())
b=int(input())
c=a*x+b*y
d=np.dot(x,y)
print("au+bv vector
is ",c) print("dot
product is " , d)
```

Output:-



Practical – 3

Aim:- Write a program to do the following:-

i) Enter an r by c matrix M (r and c being positive integers) ii) Display M in matrix format iii) Display the rows and columns of the matrix M iv) Find the scalar multiplication of M for a given scalar v) Find the transpose of the matrix M.

Program Code:-

i) & ii)

```
import numpy as np
M=np.array([[1,1,1],[3,4,7],[9,6,3]])
M
#matrix M is print("matrix
M is ",M)
Y=M[0:1]
Y
#first row of matrix M is  print("first
row of matrix M is ",Y) x=M[0:2]
#first two rows of matrix M is
print("first two rows of matrix M is ",x)
t=M[0:3]
#all rows of matrix M is print("all
three rows of matrix M is ",t)
```

Output:-

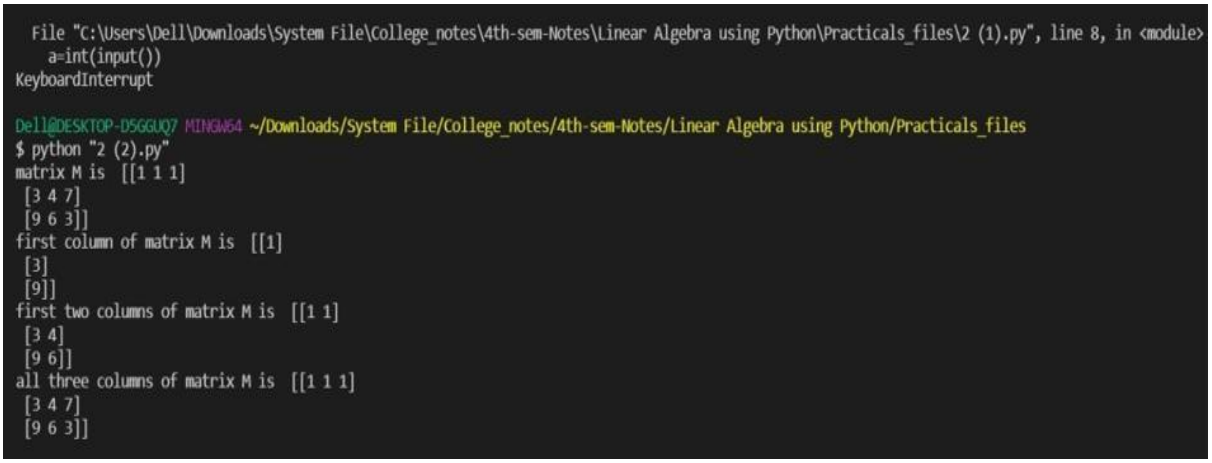
```
Dell@DESKTOP-D5GGUQ7 MINGW64 ~/Downloads/System File/College_notes/4th-sem-Notes/Linear Algebra using Python/Practicals_files
$ C:/Users/Dell/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/Dell/Downloads/System File/College_notes/4th-sem-Notes/Li
sing Python/Practicals_files/2 (3).py"
matrix M is  [[1 1 1]
 [3 4 7]
 [9 6 3]]
first row of matrix M is  [[1 1 1]]
first two rows of matrix M is  [[1 1 1]
 [3 4 7]]
all three rows of matrix M is  [[1 1 1]
 [3 4 7]
 [9 6 3]]

Dell@DESKTOP-D5GGUQ7 MINGW64 ~/Downloads/System File/College_notes/4th-sem-Notes/Linear Algebra using Python/Practicals_files
$
```

iii)

```
import numpy as np
M=np.array([[1,1,1],[3,4,7],[9,6,3]])
M
#matrix M is print("matrix
M is ",M)
Y=M[:,0:1]
Y
#first column of matrix M is
print("first column of matrix M is ",Y)
x=M[:,0:2]
#first two columns of matrix M is print("first
two columns of matrix M is ",x) t=M[:,0:3]
#all columns of matrix M is print("all
three columns of matrix M is ",t)
```

Output:-



iv)

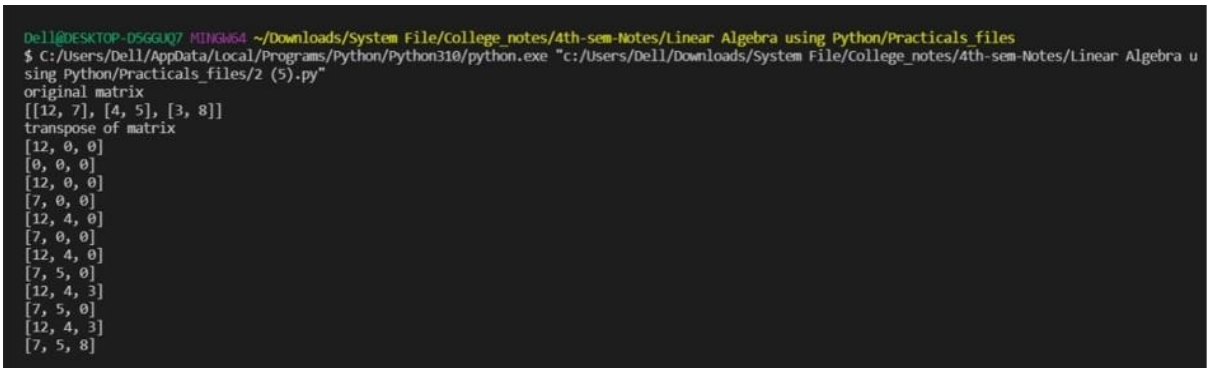
```
import numpy as np
```

```
M=np.array([[1,1,1],[3,4,7],[9,6,3]])
M
#matrix M is print("matrix M is ",M) a=6
scalar=a*M print("scalar-matrix
multiplication is  ",scalar)
```

Output:-

v)
```
x=[[12,7],[4,5],[3,8]]
t=[[0,0,0],[0,0,0]]
print("original matrix")
print(x) print("transpose of
matrix") for i in
range(len(x)):
    for j in
range(len(x[0])):
t[j][i]=x[i][j]          for r
in t:
                print(r)
```

Output:-



Practical – 4

Aim:- Write a program to do the following:-

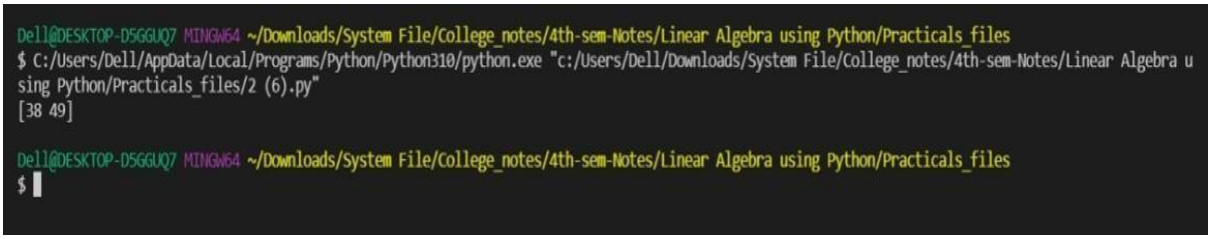
i) Find the vector – matrix multiplication of a r by c matrix M with an c-vector u. ii) Find the matrix – matrix product of M with a c by p matrix N.

Program Code:-

i)

```
import numpy as np x=np.array([1,4,6])
y=np.array([[2,3],[3,4],[4,5]])
print(np.dot(x,y))
```

Output:-

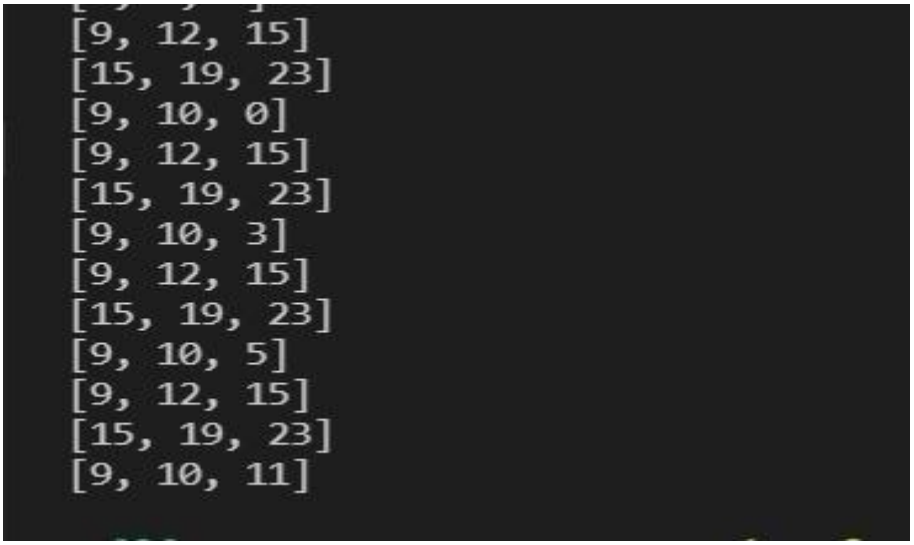


ii)

```
  import numpy as np
A=np.array([[3,2,2],[4,1,5],[1,2,3]])
print("matrix A is "A)
B=np.array([[1,2,3],[1,1,1],[2,2,2]])
print("matrix B is "B)
print("multiplication of two matrices A & B is ")
M=([[0,0,0],[0,0,0],[0,0,0]]) for i in
range(len(A)):      for j in range(len(B[0])):
        for k in range(len(B)):
                    M[i][j]+=A[i][k]*B[k][j]
                for r in M:
                            print(r)
```

Output:-

```
matrix A is  [[3 2 2]
 [4 1 5]
 [1 2 3]]
matrix B is  [[1 2 3]
 [1 1 1]
 [2 2 2]]
multiplication of two matrices A & B is
[3, 0, 0]
[0, 0, 0]
[0, 0, 0]
[5, 0, 0]
[0, 0, 0]
[0, 0, 0]
[9, 0, 0]
[0, 0, 0]
[0, 0, 0]
[9, 6, 0]
[0, 0, 0]
[0, 0, 0]
[9, 8, 0]
[0, 0, 0]
[0, 0, 0]
[9, 12, 0]
[0, 0, 0]
[0, 0, 0]
[9, 12, 9]
[0, 0, 0]
[0, 0, 0]
[9, 12, 11]
[0, 0, 0]
[0, 0, 0]
[9, 12, 15]
[0, 0, 0]
[0, 0, 0]
[9, 12, 15]
[4, 0, 0]
[0, 0, 0]
[9, 12, 15]
[5, 0, 0]
[0, 0, 0]
[9, 12, 15]
[15, 0, 0]
[0, 0, 0]
```


[9, 12, 15]
[15, 19, 23]
[9, 10, 0]
[9, 12, 15]
[15, 19, 23]
[9, 10, 3]
[9, 12, 15]
[15, 19, 23]
[9, 10, 5]
[9, 12, 15]
[15, 19, 23]
[9, 10, 11]