B.SC. 5TH SEMESTER MATHEMATICS (PRACTICAL FILE)

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Experiment No. 01

Object:- Find the dot product of a and b.

Scilab program:-

```
-->a = [3 5 -2]; // denote row vector 'a' like a=3i+5j-2k
--> b = [4 -1 6]; // denote row vector 'b' like b=4i+1j+6k
--> a+b          // sum of vectors 'a' and 'b'
ans =
    7 4 4        // sum is = 7i +4j+4k
--> a-b          // subtract 'b' from 'a'
 ans=
   -1 6 -8
-->a*b'          // dot product of two vectors 'a' & 'b'
 ans=
   -5
--> cross(a,b)   // cross product of vectors 'a' & 'b' i.e. axb
ans =
   28. -26. -23.  = 28i-26j-23k
--> c= [1; 3; 0]; // define column vector 'c'
--> a*c          // evaluate multiplication of 'a' and 'c'
 ans =
   18
--> c*a          // evaluate multiplication of 'c' and
 ans =           'a' vectors behave like matrix.
```

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```
   3  5  -2
   9  15 -6
   0  0   0
--> a'          // transpose of vector 'a'
 ans =
      3
      5
     -2
```

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Experiment No. 02

Objective:- Write a program to print a complex numbers and its real and imaginary part.

Complex Numbers:- The squre root of negative numbers are known as complex numbers. Mathematically we can write

$z = a + ib = r\cos\theta + r\sin\theta \Rightarrow a = r\cos\theta, b = r\sin\theta$

So $r = \sqrt{a^2 + b^2} = |z|$ and $\theta = \tan^{-1}(b/a)$

$r = |z|$ is called the absolute value or it denotes the distance of the point z from the origin. The line joing origin to point z makes an angle θ with real axis called the argument.

Program:-

```
--> c= complex(5,7)  // define a complex numbers
                     5+7i
c =
   5. + 7.i
```

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--> [s,t] = polar(c) // polar(5+7i) = [s,t]; s = r*cosθ,
t = i*r*sin θ;

s =

8.6023253 + 0.i

t =

0.9505468 - 5.551D-17i // the number '5.551D-17' is very less about to 0.

--> s* exp(%i*t)

ans =

5. +7.i

--> a = complex(-3,4) // define a complex number 'a'

a =

-3+4.i

--> abs(complex(-3,4)) or abs(a) // to obtain absolute value of 'a'

ans =

--> real(a) // to find real part of the complex number 'a'

ans =

-3

--> imag(a) // to find imaginary part of the complex number 'a'

ans =

4

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Experiment No. 03

Objecti:- Write a program to find all the roots of a quadratic equation.

Program:-

```
clc;
disp("root of quadratic equation")
        a=5
        b=-2
        c=-8
        d = b^2 - 4*a*c
        x1 = (-b+Sqrt(d)/2*a)
        x2 = (-b-Sqrt(d)/2*a)

it d<0 then
        disp([x1,x2],'root are imaginary

else if d==0
        disp([x1,x2],'root are realand equal')

else
        disp([x1,x2],root are real and unequal')
end.
```

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Experiment No. 04

Objective:- Write a program to print all primes smaller than or equal to a specified number.

Program:-

```
-->x = 27;          // define a number 'x'
-->primes(x)        // evaluate prime numbers less
                       than or equal to 'x'
ans = 2 3 5 7 11 13 17 19 23
-->factor(250)      // prime factors of a number 'n'
                       is factor(n)
ans = 2 5 5 5       // factor(250) = 2X5X5X5
-->factorial(7)     // factorial of a number 'n'
                       i.e. n! = n(n-1)(n-2)....3.2.1
ans = 5040          // 5040 = 7*6*5*4*3*2*1
-->perms([2 4 16])  // set of all possible orders
                       of elements, permutation of
                       numbers 2, 4, 1, 6
ans =               // total are 24 possible elements
                       in permutation of 4 elements
```

6. 1. 4. 2.; 6. 1. 2. 4.; 6. 4. 1. 2.; 6. 4. 2. 1.
6. 2. 1. 4.; 6. 2. 4. 1.; 1. 6. 4. 2.; 1. 6. 2. 4.
1. 4. 6. 2.; 1. 4. 2. 6.; 1. 2. 6. 4.; 1. 2. 4. 6.
4. 6. 1. 2.; 4. 6. 2. 1.; 4. 1. 6. 2.; 4. 1. 2. 6.

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Experiment No. 05

Objective: Write a program to entera matrix and check if it is invertible. it the inverce exist find the inverce.

Program:

```
disp ('matrix A corresponding to transforma-
      tion T is:')
disp (A)
A = [-5 9; 4 -7];
disp ('determinant of A is:')
disp (det(A))
 disp ('since det(A) is not equal to zero')
disp ('by IMT, A is invertible')
 disp ('hence, the inverse of A exists')

disp ('inverse of A is:')

disp (inv(A))
```

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Experiment No. 06

Object:- Find the transpase of the matrix M.

Program:-

```
-->M =                    //Define 3x3 square matrix
   42.  30.  22.
   29.  20.  35.
   21.  13.  18.

-->diag(M)                //indicate diagonal element of matrix M
ans =
   42.
   20.
   18.
-->size(M)                // indicate order of matrix in rows and colum
ans =
   3.  3.
-->trace(M)               // sum of diagonal element of matrix M
ans =
   80.
```

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Experiment No. 07

Objecti:- Find the projection of a plane.

Program:-

```
disp('If we project b=(x,y,z) onto the x-y
      plane then its projection is p=(x,y,0).
a     and is the sum of projection
      on to x- any y-axes.')

b= rand(3,1);
q1 = [1; 0; 0];
disp(q1, 'q1=');

q2 = [0; 1; 0];
disp(q2, 'q2=');

p = q1*q1' + q2*q2';

disp(p, 'Overall projection matrix, p=');

disp('and, p[x; y; z] = [x; y; 0]')

disp('projection onto a plane = sum of
      projection onto orthonormal q1
      and q2.')
// end.
```

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If we project b = (x, y, z) onto the x-y plane then it's projection is P = (x, y, 0), an

d is the sum of projection onto x- any y-axes

q1 =

1.
0.
0.

q2 =

0.
1.
0.

disp(q2, 'q2 = '); esc

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