Experiment: 01 **Date:23.02.2022**

Title: Finding Determinant of a Square Matrix.

Program Name:

a) **Write a MATLAB code for finding Determinant value of a matrix using Laplace expansion (use recursive function).**

b) **Check your program for the following example and compare the result with the value obtained by using "det" function in MATLAB.**

$$\mathbf{A} = \begin{bmatrix} 1 & 12 & -1 & 4 \\ 0 & -5 & 2 & 1 \\ 5 & 2 & -1 & 0 \\ 2 & 0 & 4 & 3 \end{bmatrix}$$

Algorithm:

1. **Start**
2. **Read the coefficients matrix** $a = [a_{ij}], i = 1, 2, \dots, m; j = 1, 2, \dots, n$
3. **Find the order of** a
4. **If number of row is equal to the number of column of** a**, then**

   Goto step 6
5. **Otherwish print an error ,** "Matrix is not Square, Determinant does not exist"
6. **Build a recursive function 'determinant'**

   If $n = 2$**, then calculate determinant by using the formula** $d = a_{11}\,a_{22} - a_{12}a_{21}$

   Otherwish,

   Initialize $d = 0$

   For $j = 1 \;\; to \;\; n$

   Create a temporary copy of a and store in A_temp

   Delete first row and j**-th coloumn of A_temp**

   $d = d + ((-1)\hat{}(1 + j)) * (a(1, j) * determinant(A\_temp))$

   Repeat j
7. **Determinant value is** d

Program Code:

a) Program Code :(For Build a recursive function determinant (determinant.m)) :

```
function d = determinant(A)
[m,n] = size(A);
if n == 2
    d=(( A(1,1)*A(2,2)) - (A(1,2)*A(2,1)));
else
    d=0;
    for j = 1:n
        A_temp = A;
        A_temp(1,:) =[];
        A_temp(:, j)=[];
        d = (d+ ((-1)^(1+j))*(A(1,j)*determinant(A_temp)));
    end
end
end
```

Program Code :(Finding Determinant of a Square Matrix):

```
A= input('Enter the matrix  :  ');
[m,n] = size(A);
if ( m ~= n)
    disp('Determinant does not exist....');
else
    d= determinant(A);
    fprintf('Determinant of the matrix is  =  %f  ',d);
end
```

Output:

```
>> EXP_1
Enter the matrix  :  [1 12 -1 4;0 -5 2 1;5 2 -1 0;2 0 4 3]
Determinant of the matrix is  =  -372.000000  >>
```

b) Program Code : (compare the result with the value obtained by using 'det' function)

```
A= input('Enter the matrix :  ');
d1=det(A);
fprintf('Determinant of the matrix is  =  %f    ',d1);
```

Output:

```
>> EXP__1_2
Enter the matrix :  [1 12 -1 4;0 -5 2 1;5 2 -1 0;2 0 4 3]
Determinant of the matrix is  =  -372.000000    >>
```

Conclusion:

We saw that , the Determinant value of the given Square Matrix (4 x 4) using Laplace expansion (using a recursive function) and the value obtained by using 'det' function are same that is,
-372.000000.