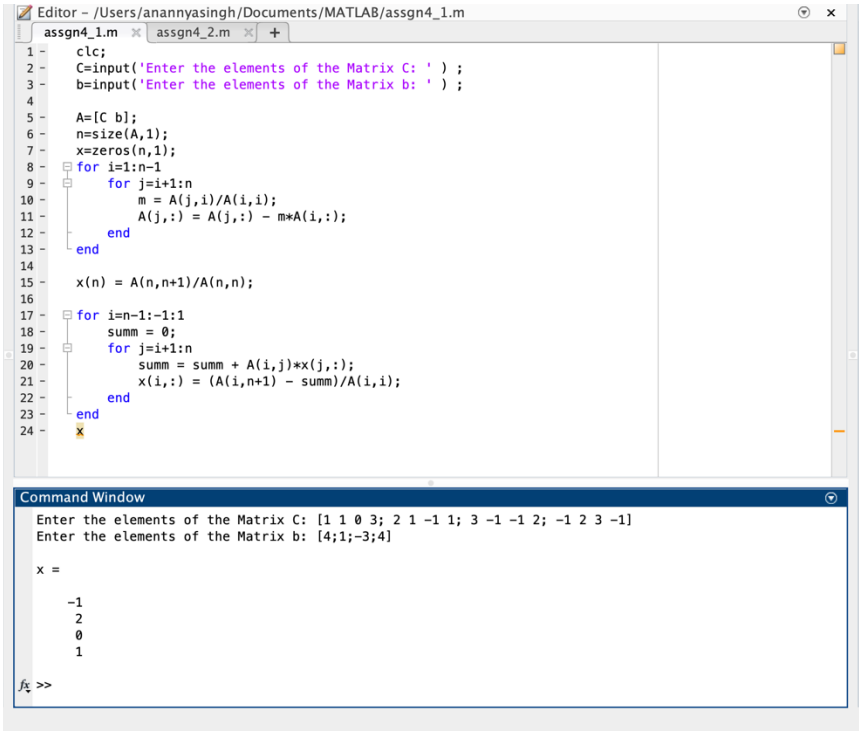
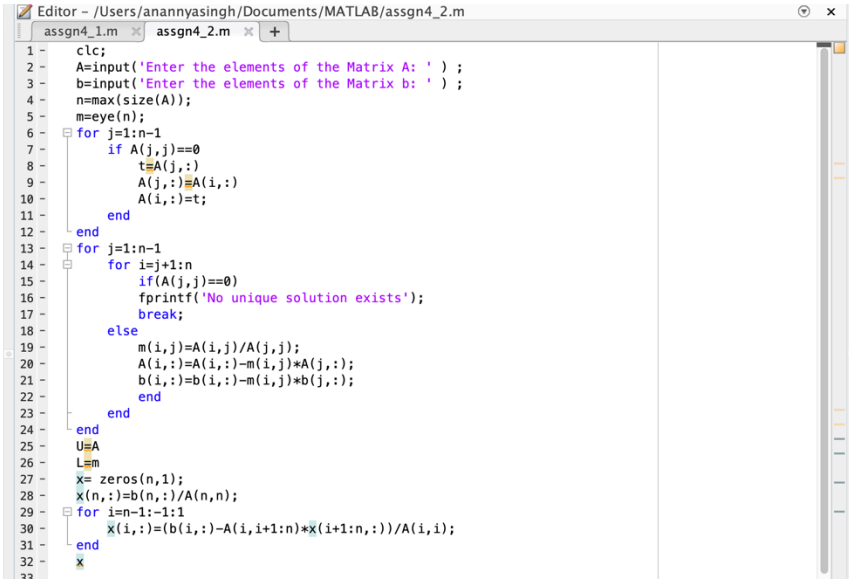
Name: Anannya Singh Roll no.:102003253 Group:CO10

Assignment-4

1. **Algorithm for Gauss elimination method:** Find a solution of system of linear equations.



2. **Algorithm for LU factorization method:** Find a solution of system of linear equations.



Name: Anannya Singh Roll no.:102003253 Group:CO10

```
Command Window
Enter the elements of the Matrix A: [1 1 0 3; 2 1 -1 1; 3 -1 -1 2; -1 2 3 -1]
Enter the elements of the Matrix b: [4;1;-3;4]

U =

     1     1     0     3
     0    -1    -1    -5
     0     0     3    13
     0     0     0   -13


L =

     1     0     0     0
     2     1     0     0
     3     4     1     0
    -1    -3     0     1


x =

    -1
     2
     0
     1

fx >>
```

3. Use Gauss elimination method to find the solution of the following linear system of equations:

$10x + 8y - 3z + u = 16$ $2x + 10y + z - 4u = 9$ $3x - 4y + 10z + u = 10$ $2x + 2y - 3z + 10u = 11$

```
Editor - /Users/anannyasingh/Documents/MATLAB/assgn4_3.m
assgn4_1.m | assgn4_2.m | assgn4_3.m
1   clc;
2   C=[10 8 -3 1; 2 10 1 -4; 3 -4 10 1; 2 2 -3 10]
3   b=[16;9;10;11]
4
5   A=[C b];
6   n=size(A,1);
7   x=zeros(n,1);
8   for i=1:n-1
9       for j=i+1:n
10          m = A(j,i)/A(i,i);
11          A(j,:) = A(j,:) - m*A(i,:);
12      end
13  end
14
15  x(n) = A(n,n+1)/A(n,n);
16
17  for i=n-1:-1:1
18      summ = 0;
19      for j=i+1:n
20          summ = summ + A(i,j)*x(j,:);
21          x(i,:) = (A(i,n+1) - summ)/A(i,i);
22      end
23  end
24  x
```

```
Command Window

C =

    10     8    -3     1
     2    10     1    -4
     3    -4    10     1
     2     2    -3    10


b =

    16
     9
    10
    11


x =

    1.0000
    1.0000
    1.0000
    1.0000

fx >>

UTF-8 script
```

1. Solve the following linear system of equations:

$\pi x_1 + 2x_2 - x_3 + x_4 = 0$ $e x_1 - x_2 + x_3 + 2x_4 = 1$ $x_1 + x_2 - 3x_3 + x_4 = 2$

$-x_1 - x_2 + x_3 - 5x_4 = 3$

Name: Anannya Singh Roll no.:102003253 Group:CO10

4. Solve the following linear system of equations:

$\pi x_1 + 2x_2 - x_3 + x_4 = 0$ $ex_1 - x_2 + x_3 + 2x_4 = 1$ $x_1 + x_2 - 3x_3 + x_4 = 2$

$-x_1 - x_2 + x_3 - 5x_4 = 3$

Editor - /Users/anannyasingh/Documents/MATLAB/assgn4_4.m

assgn4_1.m | assgn4_2.m | assgn4_3.m | assgn4_4.m

```
clc;
pi=22/7; k=sqrt(2); l=sqrt(3); o=sqrt(5); e=2.718281828459045;
A=[pi k -1 1;e -1 1 2; 1 1 -1 1; -1 -1 1 -o]
b=[0;1;2;3]
n=max(size(A));
m=eye(n);
for j=1:n-1
    if A(j,j)==0
        t=A(j,:)
        A(j,:)=A(i,:)
        A(i,:)=t;
    end
end
for j=1:n-1
    for i=j+1:n
        if(A(j,j)==0)
        fprintf('No unique solution exists');
        break;
    else
        m(i,j)=A(i,j)/A(j,j);
        A(i,:)=A(i,:)-m(i,j)*A(j,:);
        b(i,:)=b(i,:)-m(i,j)*b(j,:);
        end
    end
end
U=A
L=m
x= zeros(n,1);
x(n,:)=b(n,:)/A(n,n);
for i=n-1:-1:1
    x(i,:)=(b(i,:)-A(i,i+1:n)*x(i+1:n,:))/A(i,i);
end
x
```

Command Window

```
A =

    3.1429    1.4142   -1.0000    1.0000
    2.7183   -1.0000    1.0000    2.0000
    1.0000    1.0000   -1.0000    1.0000
   -1.0000   -1.0000    1.0000   -2.2361


b =

     0
     1
     2
     3


U =

    3.1429    1.4142   -1.0000    1.0000
         0   -2.2232    1.8649    1.1351
         0         0   -0.2204    0.9626
         0         0         0   -1.2361


L =

    1.0000         0         0         0
    0.8649    1.0000         0         0
    0.3182   -0.2474    1.0000         0
   -0.3182    0.2474   -1.0000    1.0000


x =

    4.0705
  -25.8864
  -27.8610
   -4.0451
```

5. Kirchhoff's laws of electrical circuits state that both the net flow of current through each junction and the net voltage drop around each closed loop of a circuit are zero. Suppose that a potential of V volts is applied between the points A and G in the circuit and that i_1, i_2, i_3, i_4 and i_5 represent current flow as shown in the diagram. Using G as a reference point, Kirchhoff's laws imply that the currents satisfy the following system of linear equations:

$5i_1 + 5i_2 = V$ $i_3 - i_4 - i_5 = 0$ $2i_4 - 3i_5 = 0$ $i_1 - i_2 - i_3 = 0$ $5i_2 - 7i_3 - 2i_4 = 0$

Name: Anannya Singh Roll no.:102003253 Group:CO10

Take $V = 5.5$ and solve the system.

Editor - /Users/anannyasingh/Documents/MATLAB/assgn4_5.m

assgn4_2.m | assgn4_3.m | assgn4_4.m | assgn4_5.m

```
clear;
clc;
V=5.5
A=[5 5 0 0 0; 0 0 1 -1 -1; 0 0 0 2 -3; 1 -1 -1 0 0; 0 5 -7 -2 0]
b=[V;0;0;0;0]
n=max(size(A));
m=eye(n);
for j=1:n-1
    for i=j+1:n
    if A(j,j)==0
        t=A(j,:);
        A(j,:)=A(i,:);
        A(i,:)=t;
    end
    end
end

for j=1:n-1
    for i=j+1:n
        if(A(j,j)==0)
        fprintf('No unique solution exists');
        break;
    else
        m(i,j)=A(i,j)/A(j,j);
        A(i,:)=A(i,:)-m(i,j)*A(j,:);
        b(i,:)=b(i,:)-m(i,j)*b(j,:);
        end
    end
end
U=A
L=m
x= zeros(n,1);
x(n,:)=b(n,:)/A(n,n);
for i=n-1:-1:1
    x(i,:)=(b(i,:)-A(i,i+1:n)*x(i+1:n,:))/A(i,i);
end
x
```

Command Window

```
V =

    5.5000


A =

     5     5     0     0     0
     0     0     1    -1    -1
     0     0     0     2    -3
     1    -1    -1     0     0
     0     5    -7    -2     0


b =

    5.5000
         0
         0
         0
         0


U =

    5.0000    5.0000         0         0         0
         0   -2.0000   -1.0000         0         0
         0         0    1.0000   -1.0000   -1.0000
         0         0         0    2.0000   -3.0000
         0         0         0         0  -26.7500


L =

    1.0000         0         0         0         0
    0.2000    1.0000         0         0         0
         0         0    1.0000         0         0
         0         0         0    1.0000         0
         0   -2.5000   -9.5000   -5.7500    1.0000


x =

    0.6785
    0.4215
    0.2570
    0.1542
    0.1028

fx >>
```