ASSIGNMENT – 4

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1. Algorithm for Gauss elimination method:

Editor - C:\Users\DELL\OneDrive\Documents\MATLAB\ass4_1.m

ass4_1.m | Untitled2*

```
clc;
C=input('Enter the elements of the Matrix C: ');
b=input('Enter the elements of the Matrix b: ');

A=[C b];
n=size(A,1);
x=zeros(n,1);
for i=1:n-1
    for j=i+1:n
        m=A(j,i)/A(i,i);
        A(j,:) = A(j,:) -m*A(i,:);
    end
end

x(n)=A(n,n+1)/A(n,n);

for i=n-1:-1:1
    summ=0;
    for j=i+1:n
        summ=summ+A(i,j)*x(j,:);
        x(i,:)=(A(i,n+1)-summ)/A(i,i);
    end
end
x
```

Command Window

```
Enter the elements of the Matrix C: [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]

x =

    -1
     2
     0
     1

fx >>
```

2. Algorithm for LU factorization method:

```
ass4_1.m  ass4_2.m
clc;
A=input('Enter the elements of the Matrix A: ');
b=input('Enter the elements of the Matrix b: ');
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 exits');
            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
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 - C:\Users\DELL\OneDrive\Documents\MATLAB\ass4_3.m

ass4_1.m | ass4_2.m | ass4_3.m

```
clc;
C=[10 8 -3 1;2 10 1 -4;3 -4 10 1;2 2 -3 10]
b=[16;9;10;11]

A=[C b];
n=size(A,1);
x=zeros(n,1);
for i=1:n-1
    for j=i+1:n
        m=A(j,i)/A(i,i);
        A(j,:) = A(j,:) -m*A(i,:);
    end
end

x(n)=A(n,n+1)/A(n,n);

for i=n-1:-1:1
    summ=0;
    for j=i+1:n
        summ=summ+A(i,j)*x(j,:);
        x(i,:)=(A(i,n+1)-summ)/A(i,i);
    end
end
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
```

4. Solve the following linear system of equations:

$\pi x1 + \sqrt{2}x2 - x3 + x4 = 0$

$ex1 - x2 + x3 + 2x4 = 1$

$x1 + x2 - \sqrt{3}x3 + x4 = 2$

$-x1 - x2 + x3 - \sqrt{5}x4 = 3$

```
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 -l 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 exits');
            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   -1.7321    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   -0.9525    0.9626
         0         0         0   -1.9759


L =

    1.0000         0         0         0
    0.8649    1.0000         0         0
    0.3182   -0.2474    1.0000         0
   -0.3182    0.2474   -0.2314    1.0000


x =

    1.3490
   -4.6790
   -4.0335
   -1.6563
```

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 i1, i2, i3, i4 and i5 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:

$5i1 + 5i2 = V$

$i3 - i4 - i5 = 0$

$2i4 - 3i5 = 0$

$i1 - i2 - i3 = 0$

$5i2 - 7i3 - 2i4 = 0$

```
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
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
```