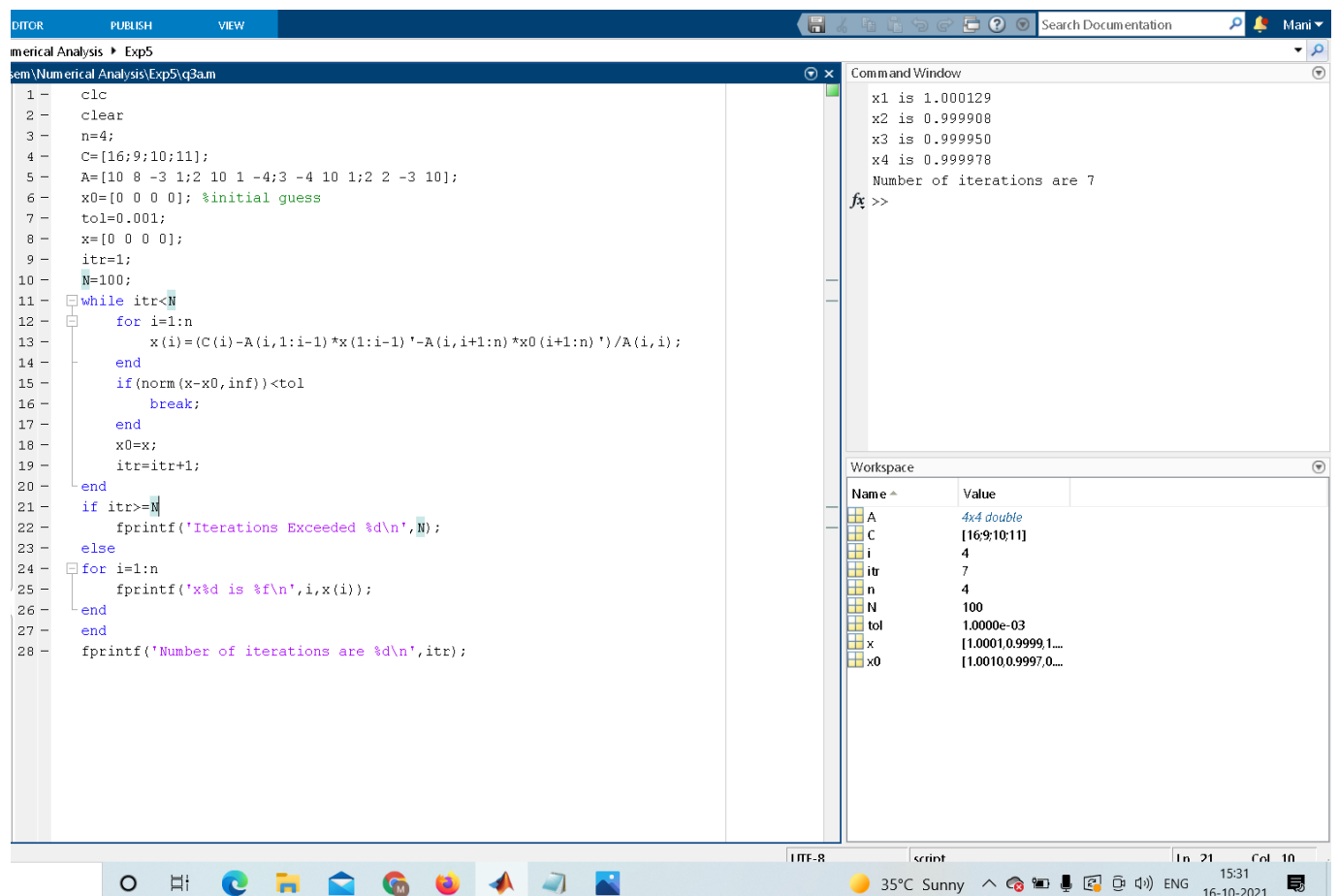


NAME: MANI GARG ROLL NO:102003470 BATCH:2CO19**EXPERIMENT-5****GAUSS-SEIDEL QUESTION:****ASSIGNMENT QUES:****Q3**

3. Use Gauss Seidel method and SOR method with $w = 1.2$ to find the solution of the following linear systems with an initial vector $[0,0,0,0]$ and tolerance value 10^{-3} in the $\| \cdot \|_{\infty}$ norm:

$$\begin{aligned} \text{(a)} \quad & 10x + 8y - 3z + u = 16 \\ & 2x + 10y + z - 4u = 9 \\ & 3x - 4y + 10z + u = 10 \\ & 2x + 2y - 3z + 10u = 11 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 4x_1 + x_2 - x_3 + x_4 = -2 \\ & x_1 + 4x_2 - x_3 - x_4 = -1 \\ & -x_1 - x_2 + 5x_3 + x_4 = 0 \\ & x_1 - x_2 + x_3 + 3x_4 = 1 \end{aligned}$$

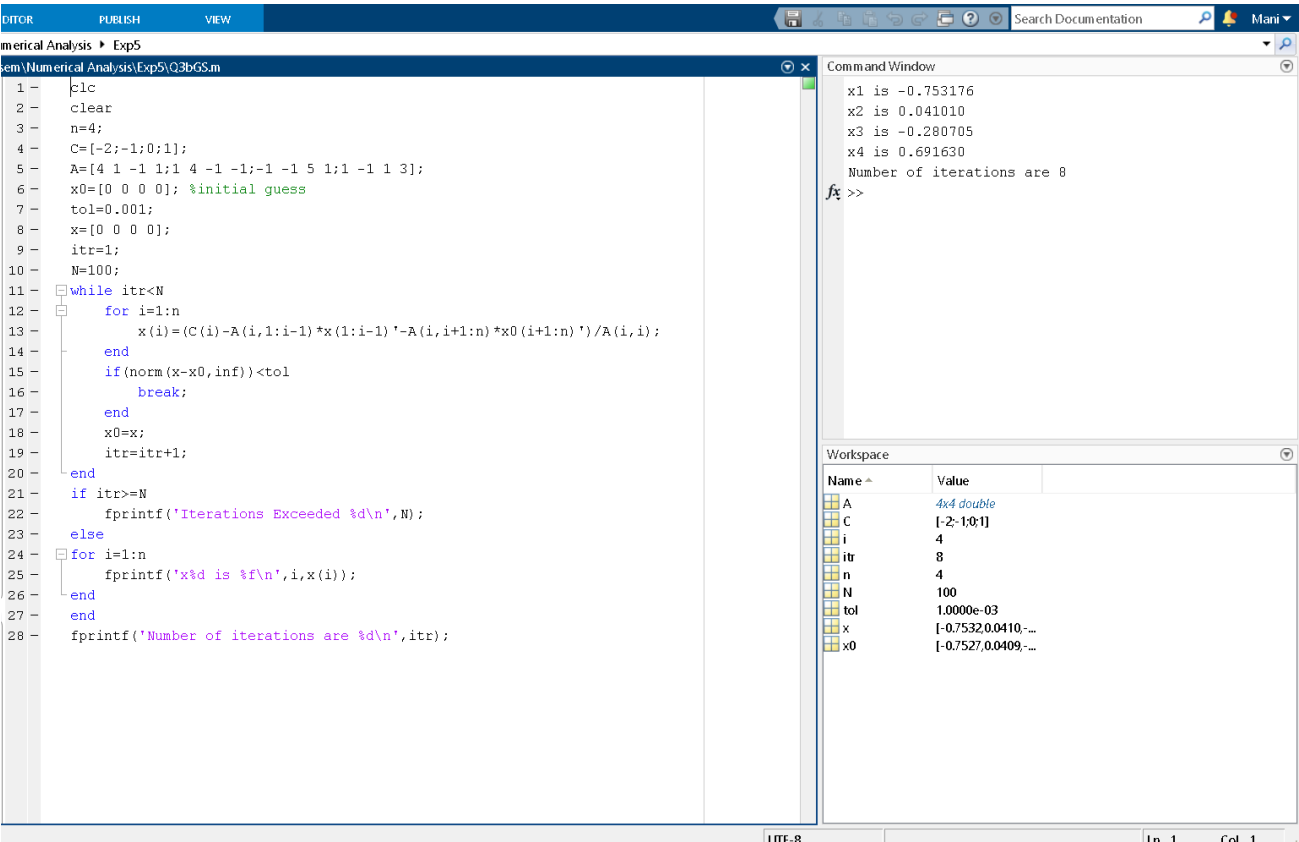
ANS3(a)**CODE:**

```

clc
clear
n=4;
C=[16;9;10;11];
A=[10 8 -3 1;2 10 1 -4;3 -4 10 1;2 2 -3 10];
x0=[0 0 0 0]; %initial guess
tol=0.001;
x=[0 0 0 0];
itr=1;
N=100;
while itr<N
    for i=1:n
        x(i)=(C(i)-A(i,1:i-1)*x(1:i-1)'-A(i,i+1:n)*x0(i+1:n:'))/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);

```

ANS3(b)



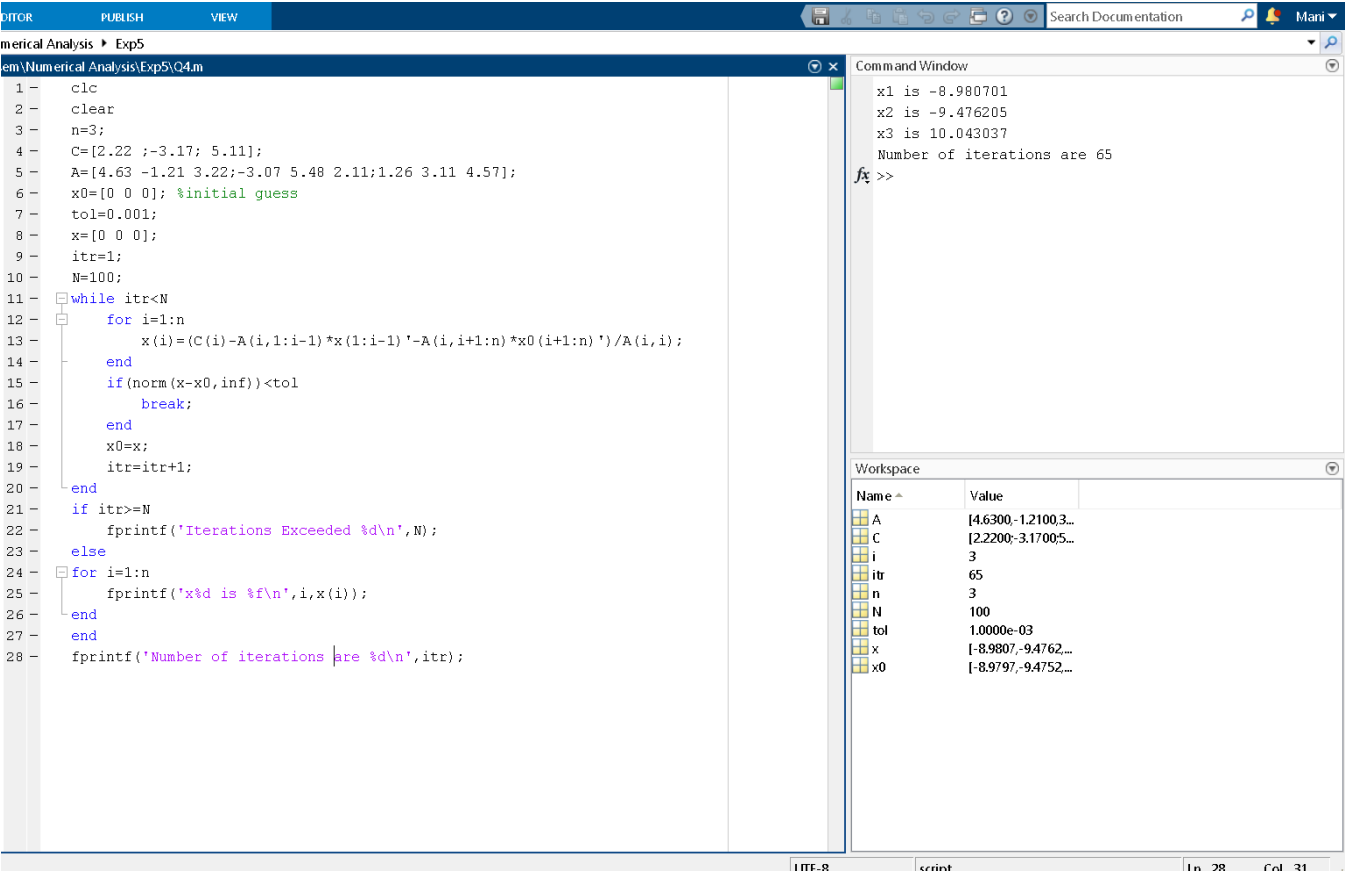
CODE:

```
clc
clear
n=4;
C=[-2;-1;0;1];
A=[4 1 -1 1;1 4 -1 -1;-1 -1 5 1;1 -1 1 3];
x0=[0 0 0 0]; %initial guess
tol=0.001;
x=[0 0 0 0];
itr=1;
N=100;
while itr<N
    for i=1:n
        x(i)=(C(i)-A(i,1:i-1)*x(1:i-1)-A(i,i+1:n)*x0(i+1:n))/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);
```

Q4

4. Use Gauss Seidel method to solve the following linear system with an initial vector [0,0,0] and tolerance value 10^{-3} in the $\|.\|_{\infty}$ norm:
- $$4.63x_1 - 1.21x_2 + 3.22x_3 = 2.22$$
$$-3.07x_1 + 5.48x_2 + 2.11x_3 = -3.17$$
$$1.26x_1 + 3.11x_2 + 4.57x_3 = 5.11$$

ANS4



CODE:

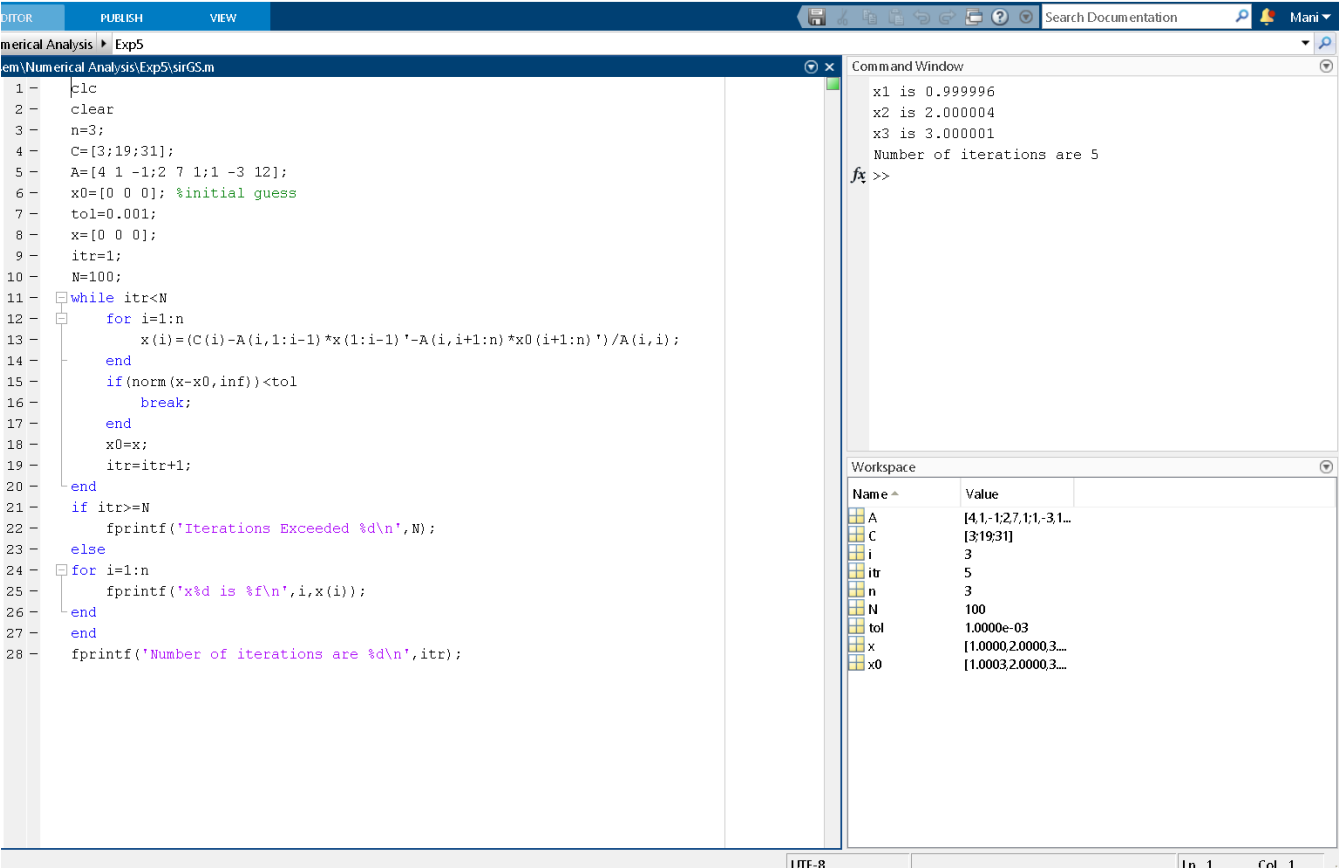
```
clc
clear
n=3;
C=[2.22 ;-3.17; 5.11];
A=[4.63 -1.21 3.22;-3.07 5.48 2.11;1.26 3.11 4.57];
x0=[0 0 0]; %initial guess
tol=0.001;
x=[0 0 0];
itr=1;
N=100;
while itr<N
    for i=1:n
        x(i)=(C(i)-A(i,1:i-1)*x(1:i-1)'+A(i,i+1:n)*x0(i+1:n)')/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);
```

EXTRA QUES (GIVEN BY SIR IN LAB):

Example 5. Use the Gauss-Seidel method to approximate the solution of the following system:

$$4x_1 + x_2 - x_3 = 3$$
$$2x_1 + 7x_2 + x_3 = 19$$
$$x_1 - 3x_2 + 12x_3 = 31.$$

ANS



CODE:

```
clc
clear
n=3;
C=[3;19;31];
A=[4 1 -1;2 7 1;1 -3 12];
x0=[0 0 0]; %initial guess
tol=0.001;
x=[0 0 0];
itr=1;
N=100;
while itr<N
    for i=1:n
        x(i)=(C(i)-A(i,1:i-1)*x(1:i-1)'-A(i,i+1:n)*x0(i+1:n)')/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);
```

SOR QUESTION:

ASSIGMENT QUES:

Q3

3. Use Gauss Seidel method and SOR method with $w = 1.2$ to find the solution of the following linear systems with an initial vector $[0,0,0,0]$ and tolerance value 10^{-3} in the $\| \cdot \|_{\infty}$ norm:

(a)

$$\begin{aligned} 10x + 8y - 3z + u &= 16 \\ 2x + 10y + z - 4u &= 9 \\ 3x - 4y + 10z + u &= 10 \\ 2x + 2y - 3z + 10u &= 11 \end{aligned}$$

(b)

$$\begin{aligned} 4x_1 + x_2 - x_3 + x_4 &= -2 \\ x_1 + 4x_2 - x_3 - x_4 &= -1 \\ -x_1 - x_2 + 5x_3 + x_4 &= 0 \\ x_1 - x_2 + x_3 + 3x_4 &= 1 \end{aligned}$$

ANS3(a)

EDITORPUBLISHVIEW

numerical Analysis ▶ Exp5

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```
1 - clc
2 - clear
3 - n=4;
4 - C=[16;9;10;11];
5 - A=[10 8 -3 1;2 10 1 -4;3 -4 10 1;2 2 -3 10];
6 - x0=[0 0 0 0]; %initial guess
7 - tol=0.001;
8 - x=[0 0 0 0];
9 - itr=1;
10 - N=100;
11 - w=1.2;
12 - while itr<N
13 -     for i=1:n
14 -         x(i)=((1-w)*x0(i))+(C(i)-A(i,1:i-1)*x(1:i-1)'-A(i,i+1:n)*x0(i+1:n'))*w/A(i,i);
15 -     end
16 -     if(norm(x-x0,inf))<tol
17 -         break;
18 -     end
19 -     x0=x;
20 -     itr=itr+1;
21 - end
22 - if itr>=N
23 -     fprintf('Iterations Exceeded %d\n',N);
24 - else
25 -     for i=1:n
26 -         fprintf('x%d is %f\n',i,x(i));
27 -     end
28 - end
29 - fprintf('Number of iterations are %d\n',itr);
```

Command Window

```
x1 is 1.000261
x2 is 1.000090
x3 is 0.999871
x4 is 0.999807
Number of iterations are 14
fx >>
```

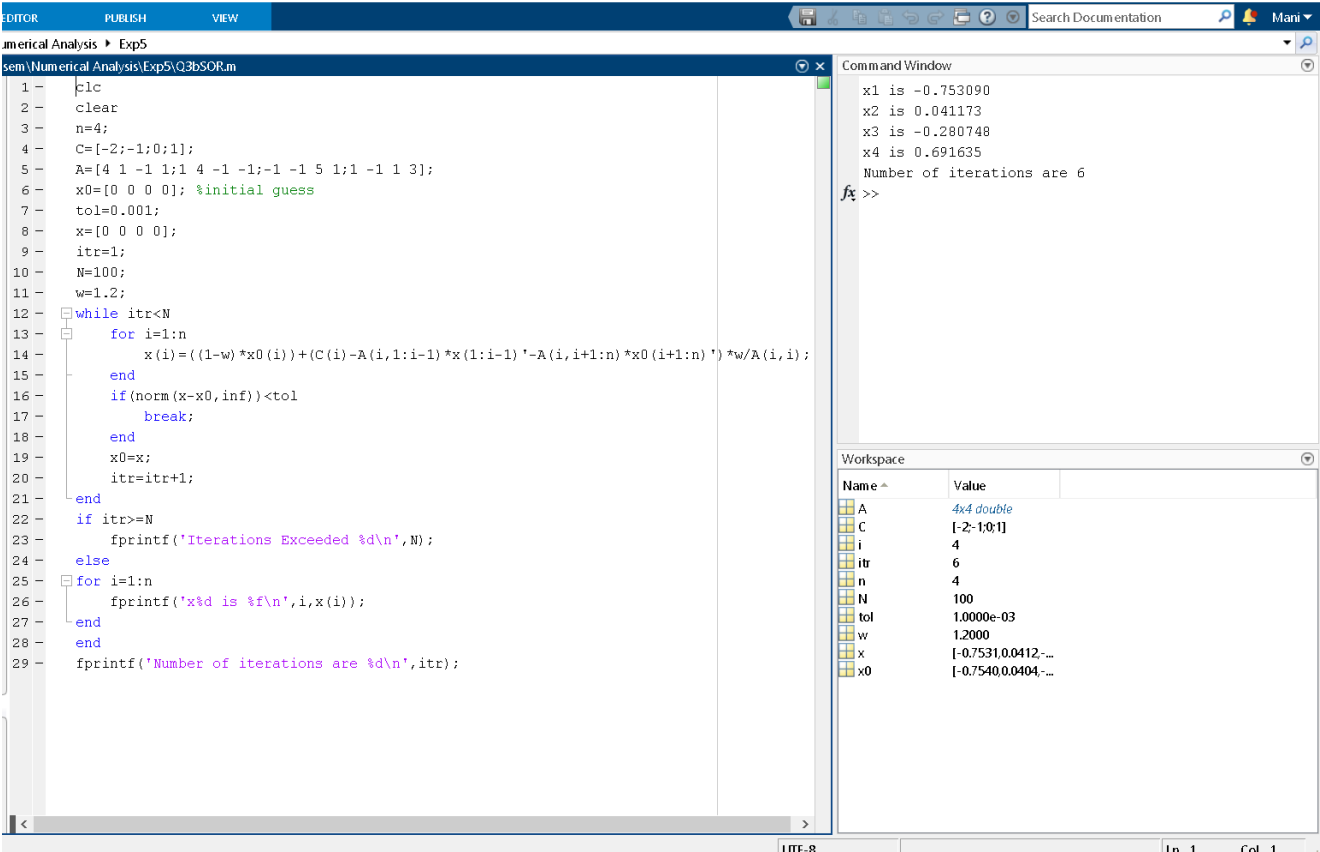
Workspace

Name	Value
A	4x4 double
C	[16;9;10;11]
i	4
itr	14
n	4
N	100
tol	1.0000e-03
w	1.2000
x	[1.0003,1.0001,0...
x0	[0.9996,0.9999,1...

CODE:

```
clc
clear
n=4;
C=[16;9;10;11];
A=[10 8 -3 1;2 10 1 -4;3 -4 10 1;2 2 -3 10];
x0=[0 0 0 0]; %initial guess
tol=0.001;
x=[0 0 0 0];
itr=1;
N=100;
w=1.2;
while itr<N
    for i=1:n
        x(i)=((1-w)*x0(i))+(C(i)-A(i,1:i-1)*x(1:i-1)'-A(i,i+1:n)*x0(i+1:n'))*w/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);
```

ANS3(b)



CODE:

```

clc
clear
n=4;
C=[-2;-1;0;1];
A=[4 1 -1 1;1 4 -1 -1;-1 -1 5 1;1 -1 1 3];
x0=[0 0 0 0]; %initial guess
tol=0.001;
x=[0 0 0 0];
itr=1;
N=100;
w=1.2;
while itr<N
    for i=1:n
        x(i)=((1-w)*x0(i))+(C(i)-A(i,1:i-1)*x(1:i-1)-A(i,i+1:n)*x0(i+1:n))*w/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);

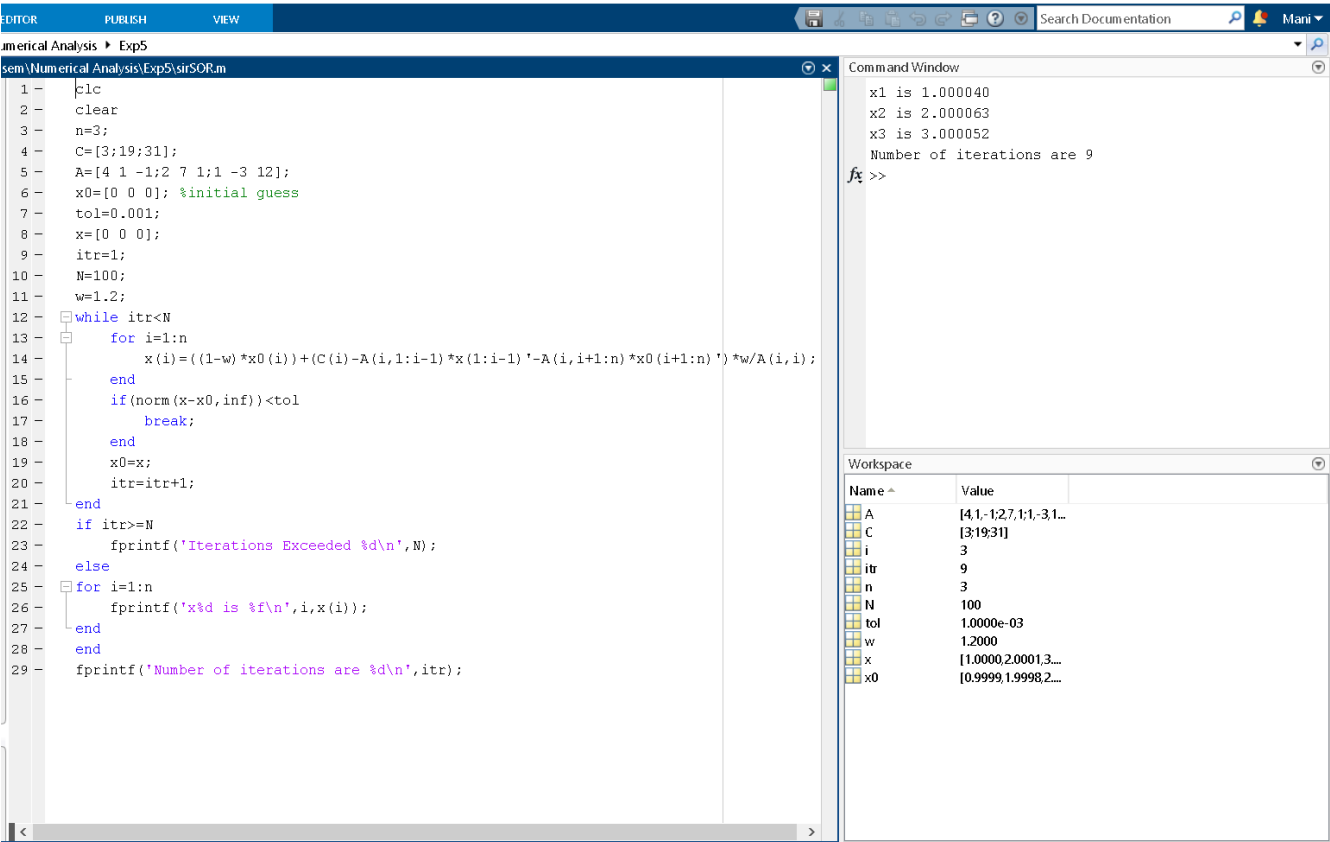
```

EXTRA QUES (GIVEN BY SIR IN LAB):

Example 5. Use the Gauss-Seidel method to approximate the solution of the following system:

$$4x_1 + x_2 - x_3 = 3$$
$$2x_1 + 7x_2 + x_3 = 19$$
$$x_1 - 3x_2 + 12x_3 = 31.$$

ANS



CODE:

```
clc
clear
n=3;
C=[3;19;31];
A=[4 1 -1;2 7 1;1 -3 12];
x0=[0 0 0]; %initial guess
tol=0.001;
x=[0 0 0];
itr=1;
N=100;
w=1.2;
while itr<N
    for i=1:n
        x(i)=((1-w)*x0(i))+(C(i)-A(i,1:i-1)*x(1:i-1)'-A(i,i+1:n)*x0(i+1:n'))*w/A(i,i);
    end
    if(norm(x-x0,inf))<tol
        break;
    end
    x0=x;
    itr=itr+1;
end
if itr>=N
    fprintf('Iterations Exceeded %d\n',N);
else
    for i=1:n
        fprintf('x%d is %f\n',i,x(i));
    end
end
fprintf('Number of iterations are %d\n',itr);
```