NAME: MANI GARG ROLL NO:102003470 BATCH:2CO19

EXPERIMENT-5

GAUSS-SEIDEL QUESTION:

ASSIGMENT QUES:

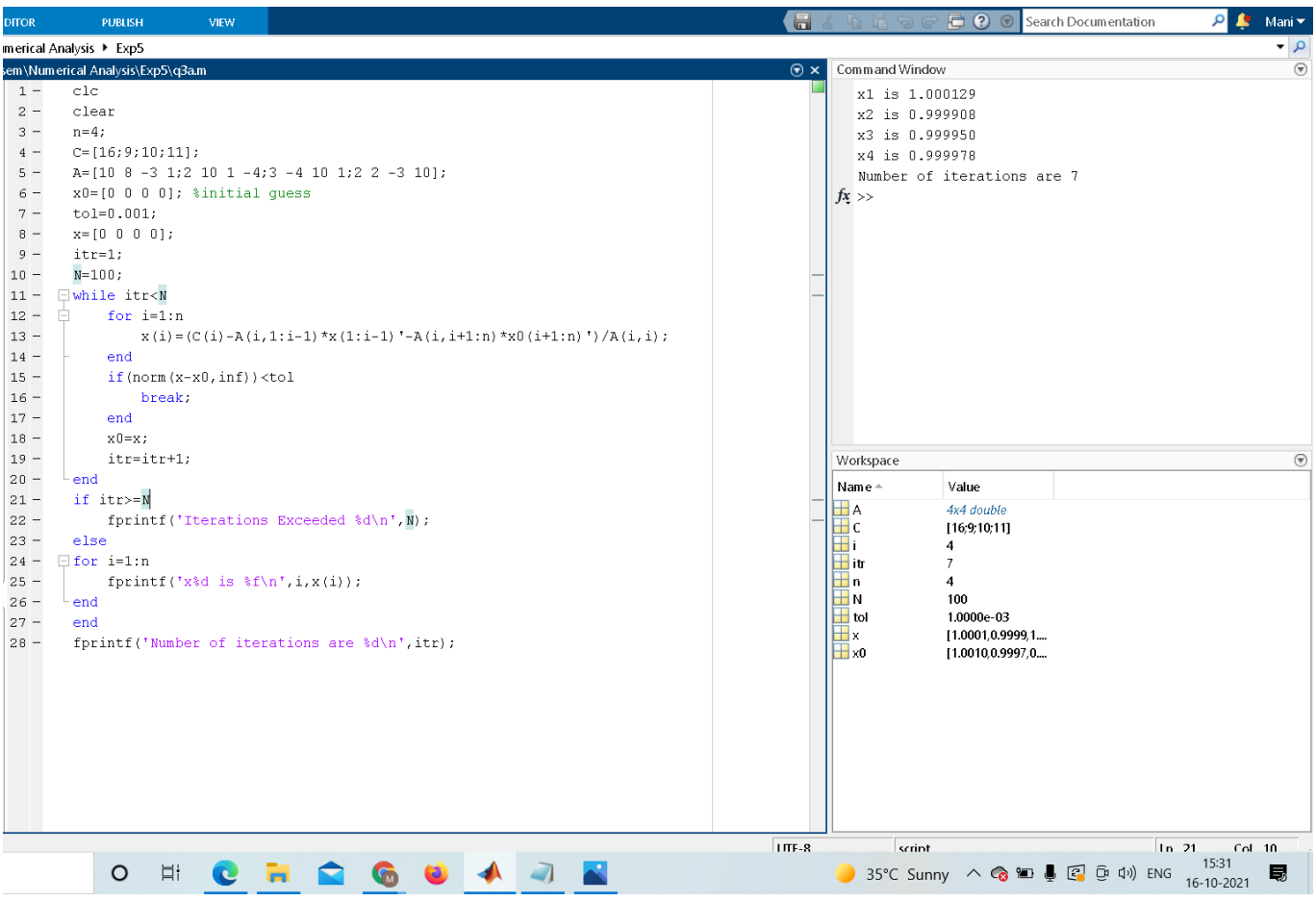
Q3

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 $\|.\|_\infty$ 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)



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);
```

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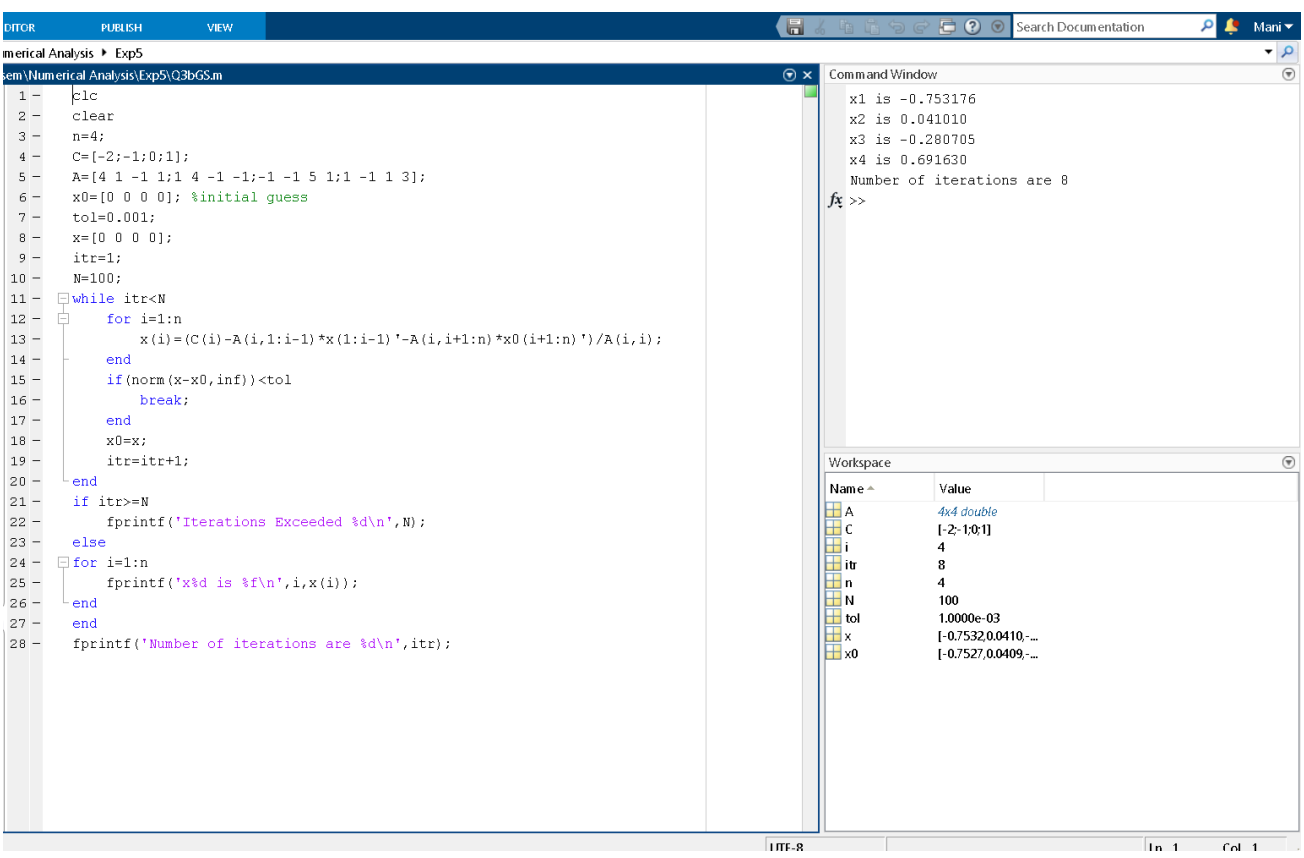
ANS3(b)



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);
```

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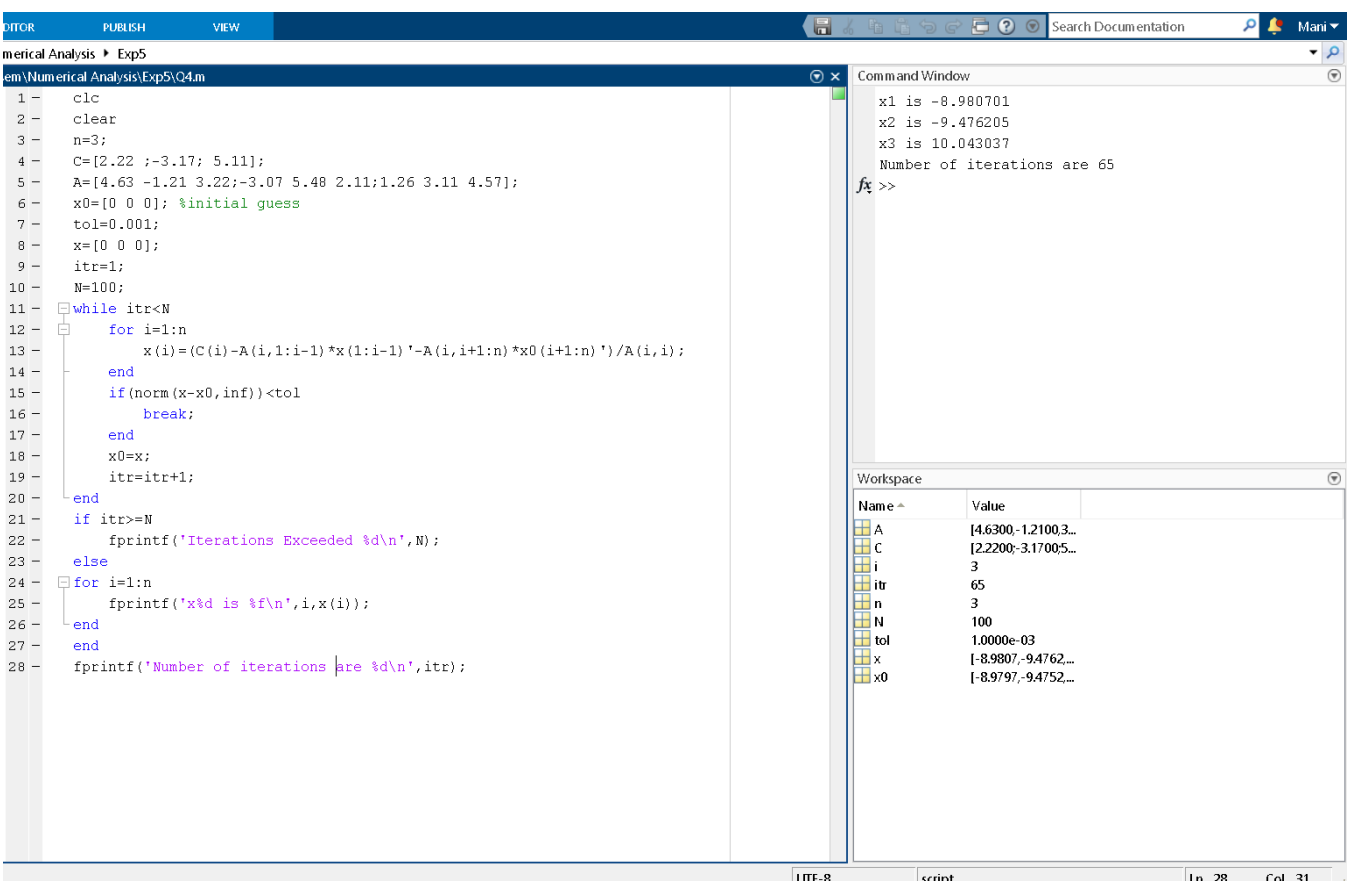
Q4

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:

$$4.63x_1 - 1.21x_2 + 3.22\,x_3 = 2.22$$
$$-3.07x_1 + 5.48x_2 + 2.11x_3 = -3.17$$
$$1.26x_1 + 3.11x_2 + 4.57x_3 = 5.11$$

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);
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   fprintf('x%d is %f\n',i,x(i));
end
end
fprintf('Number of iterations are %d\n',itr);
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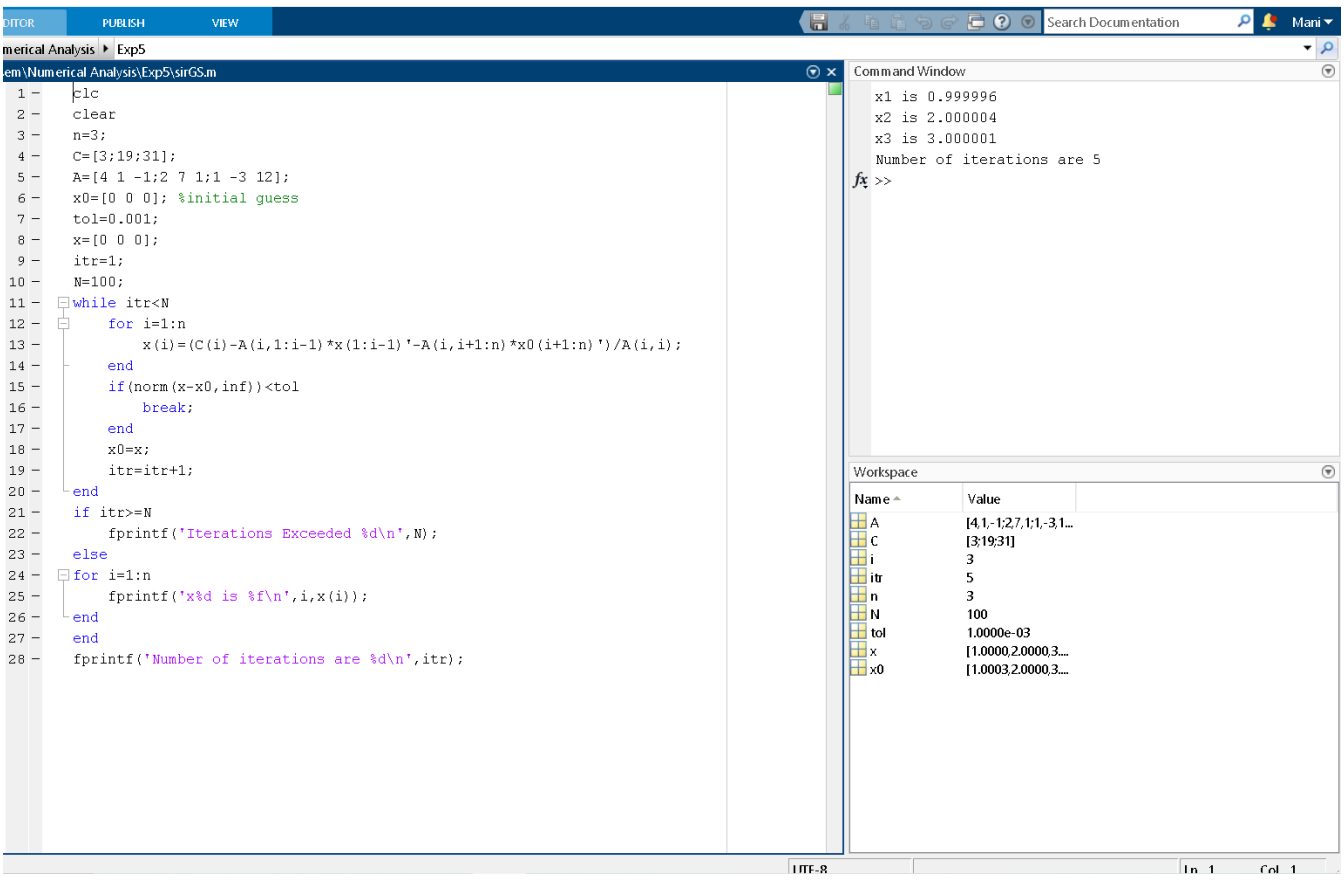
EXTRA QUES (GIVEN BY SIR IN LAB):

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

$$\begin{aligned} 4x_1 + x_2 - x_3 &= 3 \\ 2x_1 + 7x_2 + x_3 &= 19 \\ x_1 - 3x_2 + 12x_3 &= 31. \end{aligned}$$

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
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   fprintf('x%d is %f\n',i,x(i));
end
end
fprintf('Number of iterations are %d\n',itr);
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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 $\|.\|_\infty$ norm:

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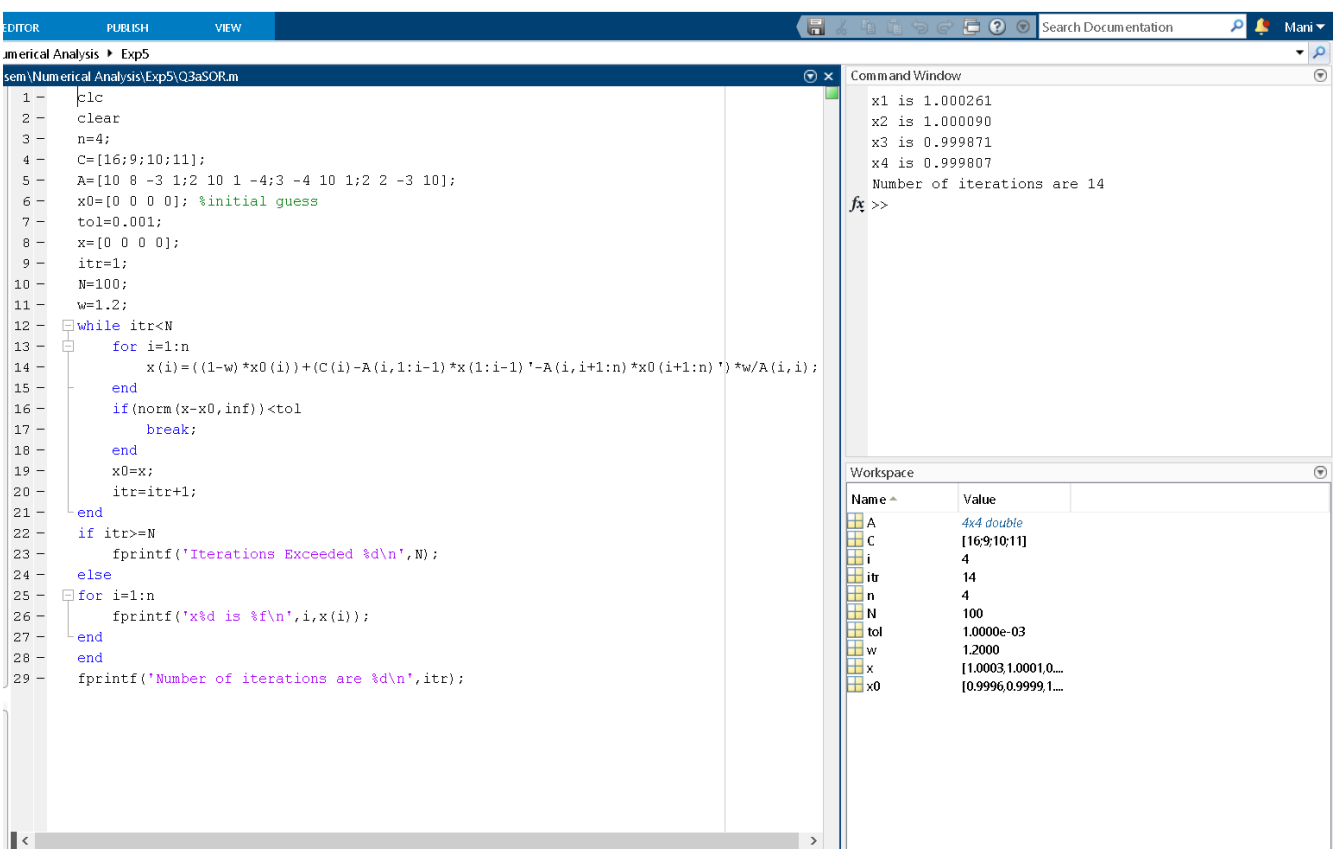
ANS3(a)



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n=4;
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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
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   fprintf('x%d is %f\n',i,x(i));
end
end
fprintf('Number of iterations are %d\n',itr);
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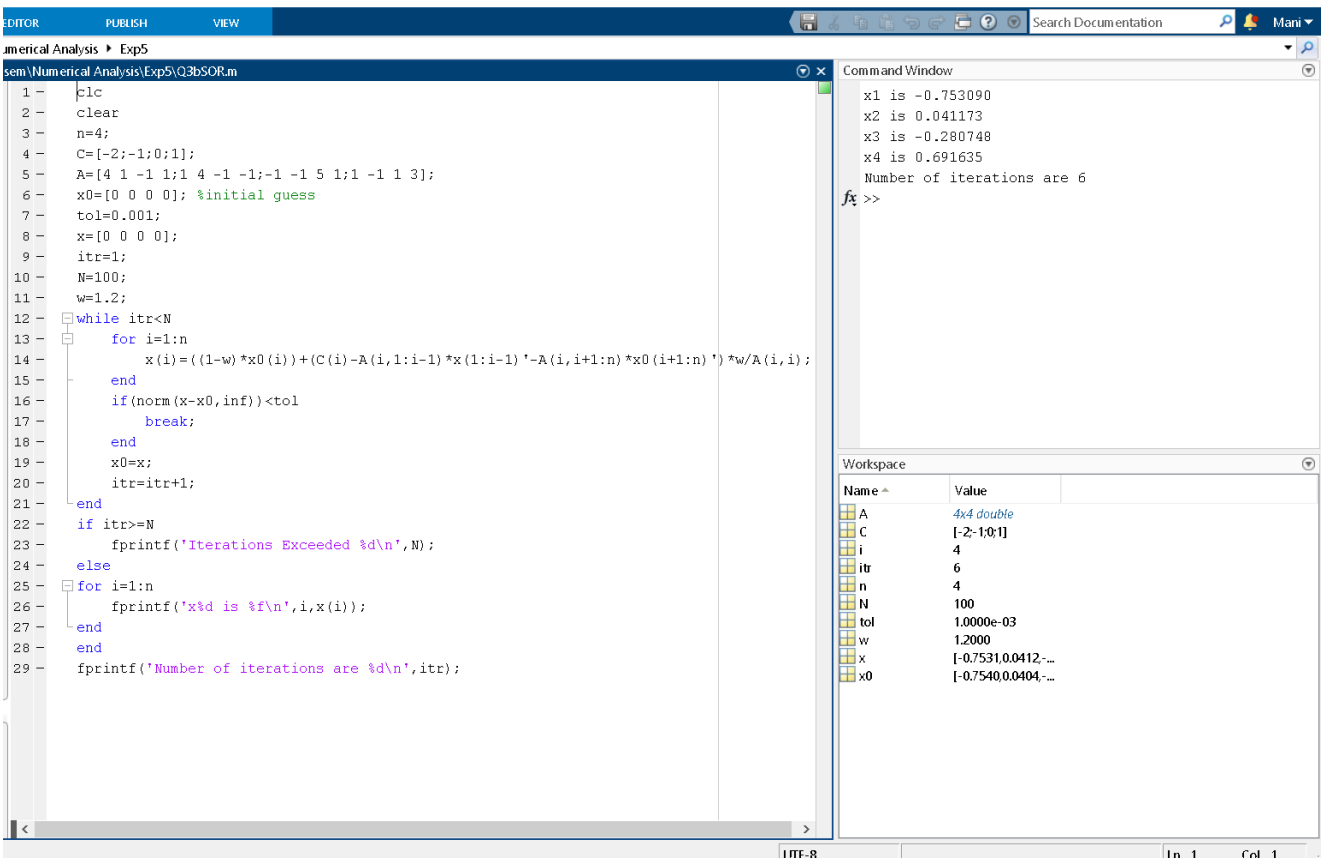
ANS3(b)



CODE:

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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);
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   x0=x;
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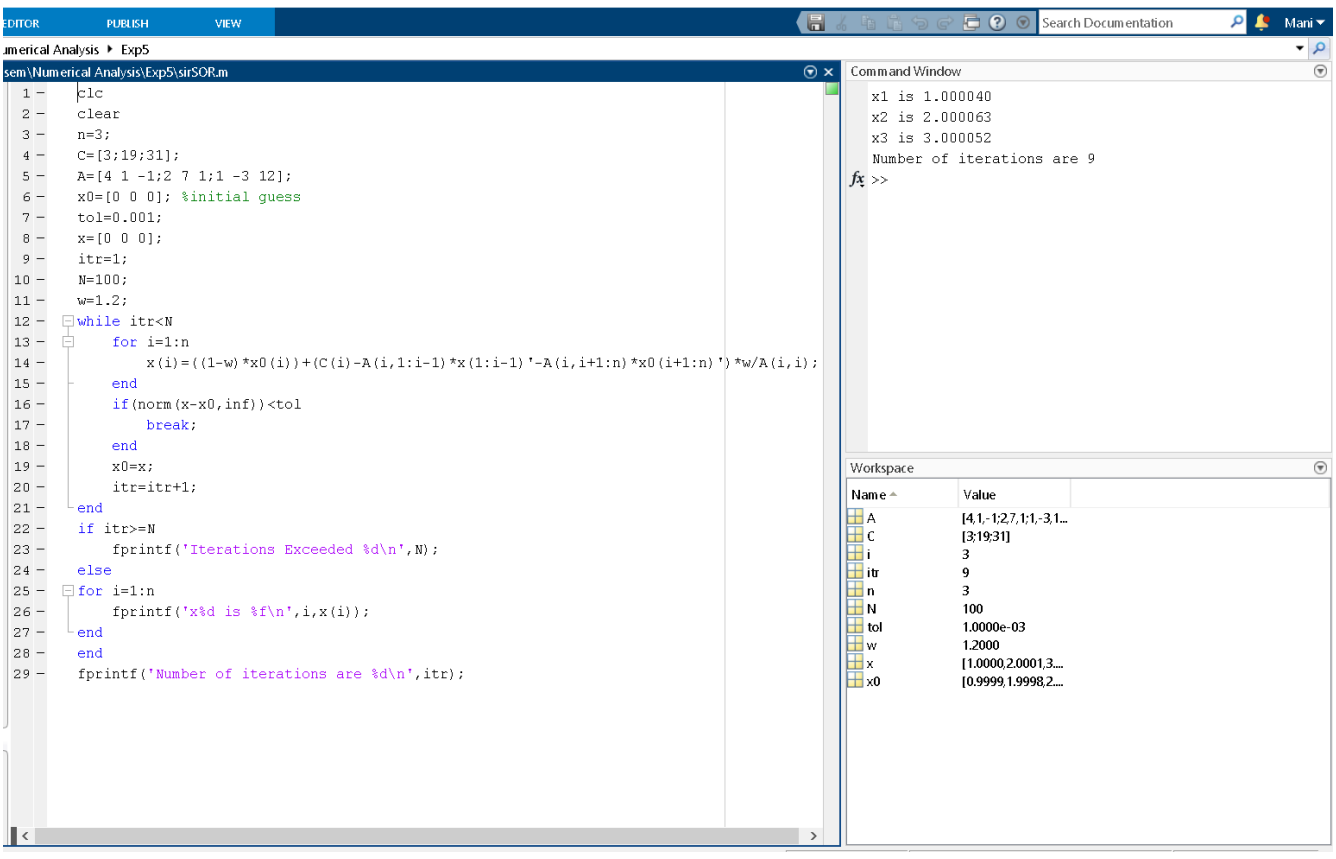
ANS



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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);
```