

**ADEBAJO-AKINPELU VICTOR**

**MATHEMATICS ASSINGMENT**

**17/ENG04/079**

**ELECTRICAL AND ELECTRONICS ENGINEERING.**

$$A = \begin{bmatrix} 10 & -2 & 1 \\ -2 & -10 & -2 \\ -2 & -5 & 10 \end{bmatrix}$$

$$B = \begin{bmatrix} 9 \\ 12 \\ 18 \end{bmatrix}$$

Using jacobi rule

$$x = Cx + d$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0 & -2/10 & -1/10 \\ -2/10 & 0 & -2/10 \\ -2/10 & -5/10 & 0 \end{bmatrix} * \begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} + \begin{bmatrix} 9/10 \\ 12/10 \\ 18/10 \end{bmatrix}$$

Initial value for m

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \text{ -----Initial value}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0 & 0.2 & -0.1 \\ 0.2 & 0 & 0.2 \\ 0.2 & 0.5 & 0 \end{bmatrix} * \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0.9 \\ 1.2 \\ 1.8 \end{bmatrix}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0.9 \\ 1.2 \\ 1.8 \end{bmatrix} \text{ ----- iteration 1}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0 & 0.2 & -0.1 \\ 0.2 & 0 & 0.2 \\ 0.2 & 0.5 & 0 \end{bmatrix} * \begin{bmatrix} 0.9 \\ 1.2 \\ 1.8 \end{bmatrix} + \begin{bmatrix} 0.9 \\ 1.2 \\ 1.8 \end{bmatrix}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0.96 \\ 1.74 \\ 2.58 \end{bmatrix} \text{ -----iteration 2}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0 & 0.2 & -0.1 \\ 0.2 & 0 & 0.2 \\ 0.2 & 0.5 & 0 \end{bmatrix} * \begin{bmatrix} 0.96 \\ 1.74 \\ 2.58 \end{bmatrix} + \begin{bmatrix} 0.9 \\ 1.2 \\ 1.8 \end{bmatrix}$$

$$\begin{bmatrix} m1 \\ m2 \\ m3 \end{bmatrix} = \begin{bmatrix} 0.99 \\ 1.908 \\ 2.862 \end{bmatrix} \text{ -----iteration 3}$$

### MATLAB CODE FOR THE SOLUTION.

```
commandwindow
clear
clc
close all
syms m1 m2 m3
format short g
a=[10 -2 1;
   -2 10 -2;
   -2 -5 10]
b=[9; 12; 18]

c= [ 0 -a(1,2)/a(1,1) -a(1,3)/a(1,1);
     -a(2,1)/a(2,2)  0 -a(2,3)/a(2,2);
     -a(3,1)/a(3,3) -a(3,2)/a(3,3)  0 ]
d= [ b(1,1)/a(1,1); b(2,1)/a(2,2) ; b(3,1)/a(3,3) ]

m1= 0
m2= 0
m3= 0

m=[m1;m2;m3]

for i= 1:50
    iter(i+1)=i;
    norma= norm(m);
    m=(c*m) + d;
    M1(i+1)=m(1,1);
    M2(i+1)=m(2,1);
    M3(i+1)=m(3,1);
    normb= norm(m);
    error(i+1)= abs(norma - normb);
        if error(i+1)<=1E-15
            break
        end
end

ans= [iter', M1', M2', M3',error']
```

## SOLUTION

a =

10	-2	1
-2	10	-2
-2	-5	10

b =

9  
12  
18

c =

0	0.2	-0.1
0.2	0	0.2
0.2	0.5	0

d =

0.9  
1.2  
1.8

m1 =

0  
m2 =

0  
m3 =

0  
m =

0  
0  
0

ans =

0	0	0	0	0
1	0.9	1.2	1.8	2.3431
2	0.96	1.74	2.58	0.91355
3	0.99	1.908	2.862	0.32271
4	0.9954	1.9704	2.952	0.10681
5	0.99888	1.9895	2.9843	0.036997
6	0.99947	1.9966	2.9945	0.012185
7	0.99987	1.9988	2.9982	0.0042271
8	0.99994	1.9996	2.9994	0.0013884
9	0.99999	1.9999	2.9998	0.0004829
10	0.99999	2	2.9999	0.00015816
11	1	2	3	5.5172e-05
12	1	2	3	1.8013e-05
13	1	2	3	6.3043e-06
14	1	2	3	2.0512e-06
15	1	2	3	7.2049e-07
16	1	2	3	2.3354e-07
17	1	2	3	8.2356e-08

18	1	2	3	2.6584e-08
19	1	2	3	9.4157e-09
20	1	2	3	3.0253e-09
21	1	2	3	1.0767e-09
22	1	2	3	3.4421e-10
23	1	2	3	1.2315e-10
24	1	2	3	3.9152e-11
25	1	2	3	1.409e-11
26	1	2	3	4.4516e-12
27	1	2	3	1.6125e-12
28	1	2	3	5.0626e-13
29	1	2	3	1.843e-13
30	1	2	3	5.7732e-14
31	1	2	3	2.1316e-14
32	1	2	3	6.2172e-15
33	1	2	3	2.6645e-15
34	1	2	3	8.8818e-16