Name: M. Rafiq Ahmad

Roll No: SP21114

Assignment #02

Question #02 (CLO-3)

$$14x + 3y = 24$$

$$3x + 14y - z = 30$$

$$-y + 4z = -24$$

by Jacobi method

* initially:

$[x_0 = 0, y_0 = 0, z_0 = 0]$

$$x_{k+1} = \frac{1}{4}(24 - 3y_k) \rightarrow (A)$$

$$y_{k+1} = \frac{1}{4}(30 - 3x_k + z_k) \rightarrow (B)$$

$$z_{k+1} = \frac{1}{4}(-24 + y_k) \rightarrow (C)$$

For $k = 0$

e.g (A):

$$x_1 = \frac{1}{4}(24 - 3y_0) = \frac{1}{4}(24 - 0)$$

C.W ☐
H.W ☐
TEST ☐

Day:
Date: ☐☐☐☐ 2 0 ☐☐

$x_1 = 6$

eq (B):

$y_1 = \frac{1}{4}(30 - 3x_0 + 3_0) = \frac{1}{4}(30 - 0 + 0)$

$y_1 = 7.5$

eq (C):

$3_1 = \frac{1}{4}(-24 + y_0)$

$3_1 = -\frac{24}{4} \Rightarrow 3_1 = -6$

for $K = 1$

eq (A): $x_2 = \frac{1}{4}(24 - 3y_1)$

$x_2 = \frac{1}{4}(24 - 3(7.5)) = \frac{1}{4}(1.5)$

$x_2 = 0.375$

eq (B): $y_2 = \frac{1}{4}(30 - 3x_1 + 3_1)$

$y_2 = \frac{1}{4}(30 - 3(6) + (-6))$

$y_2 = \frac{6}{4} \Rightarrow y_2 = 1.5$

eq (C): $3_2 = \frac{1}{4}(-24 + y_1)$

$3_2 = \frac{1}{4}(-24 + 7.5)$

$3_2 = -4.125$

for K=2

e.q(A): $x_3 = \frac{1}{4}(24 - 3y_2)$

$x_3 = \frac{1}{4}(24 - 3(1.5))$

$x_3 = \frac{19.5}{4} \Rightarrow x_3 = 4.875$

e.q(B): $y_3 = \frac{1}{4}(30 - 3x_2 + 3_2)$

$y_3 = \frac{1}{4}(30 - 3(0.375) - 4.175)$

$y_3 = \frac{24.75}{4} \Rightarrow \boxed{y_3 = 6.1875}$

e.q(C): $3_3 = \frac{1}{4}(-24 + y_2) = \frac{1}{4}(-24 + 1.5) \Rightarrow \boxed{3_3 = -5.625}$

for K=3

e.q(A): $x_4 = \frac{1}{4}(24 - 3y_3)$

$x_4 = \frac{1}{4}(24 - 3(6.1875)) = \frac{5.4375}{4}$

$x_4 = 1.359375$

e.q(B):

$y_4 = \frac{1}{4}(30 - 3x_3 + 3_3)$

$y_4 = \frac{1}{4}(30 - 3(4.875) - 5.625)$

$y_4 = 2.4375$

e.q(C):

$3_4 = \frac{1}{4}(-24 + y_3) = \frac{1}{4}(-24 + 6.1875)$

$3_4 = -4.453125$

For K = 4

(A) $x_5 = \frac{1}{4}(24 - 3y_4) = \frac{1}{4}(24 - 3(2.4375))$

$x_5 = 4.171875$

(B) $y_5 = \frac{1}{4}(30 - 3x_4 + 3_4) = \frac{1}{4}(30 - 3(1.3593375) - 4.453125)$

$y_5 = 5.3671875$

(C) $3_5 = \frac{1}{4}(-24 + y_4) = \frac{1}{4}(-24 + 2.4375)$

~~$3_5 = -4.6582\,0312\,5$~~ $3_5 = -5.390625$

For K = 5

(A) $x_6 = \frac{1}{4}(24 - 3y_5) = \frac{1}{4}(24 - 3(5.3671875))$

$x_6 = 1.97460\,9375$

(B) $y_6 = \frac{1}{4}(30 - 3x_5 + 3_5)$

$y_6 = \frac{1}{4}(30 - 3(4.171875) - 5.390625)$

~~$y_6 = 3.2065\,42969$~~

$y_6 = 3.0234375$

(C) $3_6 = \frac{1}{4}(-24 + y_5) = \frac{1}{4}(-24 + 5.3671875)$

$3_6 = -4.6582\,0312\,5$

For K = 6

(A) $x_7 = \frac{1}{4}(24 - 3y_6) = \frac{1}{4}(24 - 3(3.0234375))$

$x_7 = 3.7372\,4218\,75$

C.W ☐
H.W ☐
TEST ☐

Date: ☐☐☐☐20☐☐

(B) $y_7 = \frac{1}{4}(30 - 3x_6 + 3y_6)$

$y_7 = \frac{1}{4}(30 - 3(1.97460937\overline{5}) - 4.65820312\overline{5})$

$y_7 = 4.85449218\overline{8}$

(C) $z_7 = \frac{1}{4}(-24 + y_6) = \frac{1}{4}(-24 + 3.023437\overline{5})$

$z_7 = -5.244140\overline{625}$

For $K = 7$

(A) $x_8 = \frac{1}{4}(24 - 3y_7) = \frac{1}{4}(24 - 3(4.85449218\overline{8}))$

$x_8 = 2.35913085\overline{9}$

(B) $y_8 = \frac{1}{4}(30 - 3x_7 + 3z_7)$

$y_8 = \frac{1}{4}(30 - 3(3.73242187\overline{5}) - 5.244140\overline{625})$

$y_8 = 3.38965078\overline{1}$

(C) $z_8 = \frac{1}{4}(-24 + y_7)$

$z_8 = \frac{1}{4}(-24 + 4.85449218\overline{8})$

$z_8 = -4.78637695\overline{3}$

For $K = 8$

(A) $x_9 = \frac{1}{4}(24 - 3z_8) = \frac{1}{4}(24 - 3(3.38965078\overline{1}))$

$x_9 = 3.45776191\overline{4}$

(B) $y_9 = \frac{1}{4}(30 - 3x_8 + 3z_8)$

$y_9 = \frac{1}{4}(30 - 3(2.35913085\overline{9}) - 4.78637695\overline{3})$

$y_9 = 4.53405761\overline{8}$

Checked By: ____

Q.01 [CLO-1]

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$|A - \lambda I_3| = 0$$

$$\begin{vmatrix} a_{11}-\lambda & a_{12} & a_{13} \\ a_{21} & a_{22}-\lambda & a_{23} \\ a_{31} & a_{32} & a_{33}-\lambda \end{vmatrix} = 0$$

$$(a_{11}-\lambda)\begin{vmatrix} a_{22}-\lambda & a_{23} \\ a_{32} & a_{33}-\lambda \end{vmatrix} - a_{12}\begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33}-\lambda \end{vmatrix} + a_{13}\begin{vmatrix} a_{21} & a_{22}-\lambda \\ a_{31} & a_{32} \end{vmatrix} = 0$$

$$(a_{11}-\lambda)\left((a_{22}a_{33} - a_{22}\lambda - a_{33}\lambda + \lambda^2) - a_{23}a_{32}\right) - a_{12}\left(a_{21}a_{33} - a_{21}\lambda - a_{23}a_{31}\right)$$

$$+ a_{13}\left(a_{21}a_{32} - (a_{22}a_{31} - a_{31}\lambda)\right) = 0$$

$$a_{11}a_{22}a_{33} - a_{11}a_{22}\lambda - a_{11}a_{33}\lambda + a_{11}\lambda^2 - a_{11}a_{23}a_{32} - a_{22}a_{33}\lambda$$
$$+ a_{22}\lambda^2 + a_{33}\lambda^2 - \lambda^3 + a_{23}a_{32}\lambda - a_{12}a_{21}a_{33} + a_{12}a_{21}\lambda + a_{12}a_{23}a_{31}$$
$$+ a_{13}a_{21}a_{32} - a_{13}a_{22}a_{31} + a_{13}a_{31}\lambda = 0$$

$$\lambda^3 - (a_{11}+a_{22}+a_{33})\lambda^2 + (a_{11}a_{22} + a_{11}a_{33} + a_{22}a_{33} - a_{12}a_{21} - a_{23}a_{32}$$
$$- a_{13}a_{31})\lambda - a_{11}a_{22}a_{33} + a_{11}a_{23}a_{32} + a_{12}a_{21}a_{33} - a_{12}a_{23}a_{31}$$
$$- a_{12}a_{21}a_{32} + a_{13}a_{22}a_{31} = 0$$

$\lambda^3 - \text{trace}(A)\lambda^2 + (a_{11}a_{22} + a_{11}a_{33} + a_{22}a_{33} - a_{12}a_{21} - a_{23}a_{32} - a_{13}a_{31})\lambda$
$- |A| = 0$

Question # 02 [CLO-3]

$14x + 3y = 24$
$3x + 14y - z = 30$
$-y + 4z = -24$

by Seidel Method

$x_{k+1} = \frac{1}{14}(24 - 3y_k)$

For K=0 !

∴ initially
∴ $x_0 = 0, y_0 = 0, z_0 = 0$

$x_1 = \frac{1}{14}(24 - 3y_0)$

$x_1 = 1.714285714$

$y_1 = \frac{1}{14}(30 - 3x_1 + z_0) = \frac{1}{14}(30 - 3(1.714285714) + 0)$

$y_1 = 1.775510204$

$z_1 = \frac{1}{4}(-24 + y_1) = \frac{1}{4}(-24 + 1.775510204)$

$z_1 = -5.556122449$

For K=1

$x_2 = \frac{1}{14}(24 - 3y_1)$

$x_2 = 1.333819242$

$y_2 = \frac{1}{14}(30 - 3x_2 + z_1)$

$y_2 = 1.460172845$

$z_2 = \frac{1}{4}(-24 + y_2)$

$z_2 = -5.6349456789$

For K = 2

$x_3 = \frac{1}{14}(24 - 3y_2)$

$x_3 = 1.4013915 33$

$y_3 = \frac{1}{14}(30 - 3x_3 + 3z_2)$

$y_3 = 1.4400620 44$

$z_3 = \frac{1}{4}(-24 + y_3)$

$z_3 = -5.6399844 89$

For K = 3

$x_4 = \frac{1}{14}(24 - 3y_3)$

$x_4 = 1.4057009 91$

$y_4 = \frac{1}{14}(30 - 3x_4 + 3z_3)$

$y_4 = 1.4387794 967$

$z_4 = \frac{1}{4}(-24 + 3y_4)$

$z_4 = -5.6403051 33$

For K = 4

$x_5 = \frac{1}{14}(24 - 3y_4)$

$x_5 = 1.4054758 29$

$y_5 = \frac{1}{14}(30 - 3x_5 + 3z_4)$

$y_5 = 1.4386976 7$

$z_5 = \frac{1}{4}(-24 + y_5)$

$z_5 = -5.6403255 82$

For K = 5

$x_6 = \frac{1}{14}(24 - 3y_5)$

$x_6 = 1.4059933 56$

$y_6 = \frac{1}{14}(30 - 3x_6 + 3z_5)$

$y_6 = 1.4386924 54$

$z_6 = \frac{1}{4}(-24 + y_6)$

$z_6 = -5.6403268 87$