Date: July 23, 2020 Usama Sarwar FA17-BCS-090

Solution

Question 2.

Rearranging

$$3x_1 = 1 + x_2 - x_3$$

Dividing by 3

$$x_1 = \frac{1}{3} + \frac{x^2}{3} - \frac{x^3}{3}$$

$$6x^2 = -3x_1 - 2x_3$$

Dividing by 6

$$x_2 = \frac{-x_1}{2} - \frac{x_3}{3}$$

$$7x_3 = 4 - 3x_1 - 3x_2$$

Dividing by 7

$$x_3 = \frac{4}{7} - \frac{3}{7}x_1 - \frac{3}{7}x_2$$

Initial Approximation

$$x_1' = \frac{1}{3} + \frac{1}{3}(0) - \frac{1}{3}(0) = 0.3333$$

$$x_2' = \frac{0}{6} + \frac{-3}{6}(0.333) - \frac{2}{6}(0) = -0.1666$$

$$x_3' = 0.50000$$

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$x_1^2 = 0.11111111$

$x_2^2 = -0.2222222$

$x_3^2 = 0.61904761$

Jalale

0	1	2	3
0	0.333333	0.111111	0.052910052 93
0	-0.166666	-0.222222	-0.232804232 8
0	0.500000	0.61904761	0.648526677 1

4	5	6
0.039 55651	0.036149 20397	0.035 35106
-0.235 9536467	-0.236607 517	-0.236 7882 17
0.655 987474	0.657 3392774	0.657 7589 53

7

0.035 1508 0657

-0.236 8283 878

0.657 8618 206

Relative Error

$$\frac{(x^7 - x^6)}{x^7} < 10^{-3}$$

$$= \frac{|0.035150806 57 - 0.035351068 271|}{0.035150806 51} < 10^{-3}$$

$$= 5.697721493 \times 10^{-3} < 10^{-3}$$ Iteration stop 7

Answer

$x^7 = (0.035150806 57, -0.236828383 78, 0.657861820 6)$

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Solution

Question 1

1.19	2.11	100	1	:	1.12
14.2	-0.122	12.2	-1	:	3.44
100	-99.9	0	1	:	2.15
15.3	0.110	-13.1	-1	:	4.16

Using the formula

$$a'_{ij} = a_{ij} - \frac{a_{ik}}{a_{kk}} a_{kj}$$

For $K=1$ we get

if $i=2$, $j=1$, $k=1$

$$a' = a_1 - \frac{a_{21}}{a_{11}} a_{11} = 0$$

$a_{21} = 14.2$, $a_{11} = 1.19$

if $i=3$; $j=1$; $k=1$

$$a_{31} = a_{31} - \frac{a_{31}}{a_{11}} a_{11} = 100 - \frac{100}{1.19} \times 1.19 = 0$$

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14.2	−0.122	12.2	−1	:	3.44
0	2.12023944	−101.02279	1.08	:	0.8317
0	100	−99.9	1	:	2.15
0	0.24145	−26.8	0.074	:	0.4532

For $k=2$ we get

14.2	0.122	72.2	−1	:	3.44
0	100	−99.9	1	:	2.15
0	2.12021	−101.02259	1.0838	:	0.83171
0	0.24148020	−26.24507	0.07746	:	0.4535211

Applying formula with $k=2$ we get

14.2	−0.122	12.1	−1	:	3.44
0	100	99.9	1	:	2.15
0	0	−98.9204	1.06260	:	0.78613
0	0.24145	−26.24807	0.7746	:	0.45321

Again Applying $k=3$ we get

14.2	−0.122	12.1	−1	3.44
0	100	−99.9	1	2.15
0	0	−98.90729	1.29	0.7861334
0	0	−26.00398	0.07506	0.44832

We again apply guasian formula for

$$a_{ij}'''' = a_{ij}''' - \frac{a_{ik}}{a_{kk}} a_{kj}$$

We get

$$\left|\begin{array}{lllll:l} 14.2 & -0.122 & 12.2 & -1 & : & 3.44 \\ 0 & 100 & -99.9 & 1 & : & 2.15 \\ 0 & 0 & -98.9042 & 1.6266 & : & 0.78133 \\ 0 & 0 & 0 & -0.20432 & : & 0.241640 \end{array}\right|$$

Applying backword we get

$x_1 = 0.186$ $\quad$ $x_2 = 0.0103$

$x_3 = -0.0200$ $\quad$ $x_4 = -1.12$