

PHM 114: Numerical Analysis

Name: ..Omar Alaa Elmaghrabi..... ID.: 2110197 Section: 4....

System of Linear Equations

(7) Apply Gauss Elimination method to find the approximate solution of the system:

$$2x_1 + 10x_2 + 3x_3 = 15$$

$$10x_1 + x_2 + 2x_3 = 13$$

$$5x_1 - 3x_2 + 10x_3 = 12$$

$$\Rightarrow \begin{pmatrix} x_1 & x_2 & x_3 \\ 2 & 10 & 3 \\ 10 & 1 & 2 \\ 5 & -3 & 10 \end{pmatrix} \begin{vmatrix} 15 \\ 13 \\ 12 \end{vmatrix} \quad \begin{matrix} -5 \times R_1 + R_2, & -\frac{5}{2} \times R_1 + R_3 \end{matrix}$$

$$\Rightarrow \begin{pmatrix} 2 & 10 & 3 \\ 0 & -49 & -13 \\ 0 & -28 & \frac{5}{2} \end{pmatrix} \begin{vmatrix} 15 \\ -62 \\ -51/2 \end{vmatrix}$$

$$\begin{matrix} -\frac{14}{7} R_2 + R_3 \end{matrix}$$

$$\Rightarrow \begin{pmatrix} 2 & 10 & 3 \\ 0 & -49 & -13 \\ 0 & 0 & \frac{139}{14} \end{pmatrix} \begin{vmatrix} 15 \\ -62 \\ \frac{139}{14} \end{vmatrix} \Rightarrow \text{Row echelon Form}$$

$$\boxed{x_3 = 1}, \quad \boxed{x_2 = 1}, \quad \boxed{x_1 = 1}$$

Major Task

Total: 30 marks

PHM 114: Numerical Analysis

Name: Omar Alaa Elhachimi ID: 2180197 Section: 4

System of Linear Equations

(8) Apply Jacobi method to find the approximate solution of the system:

$$2x_1 + 10x_2 + 3x_3 = 15$$

$$10x_1 + x_2 + 2x_3 = 13$$

$$5x_1 - 3x_2 + 10x_3 = 12 \text{ to within an accuracy of } 0.01.$$

$$x_1 = 1, x_2 = 1, x_3 = 1$$

Initial values: $x_1 = 0, x_2 = 0, x_3 = 0$

$$x_1 = \frac{13 - x_2 - 2x_3}{10}, x_2 = \frac{15 - 3x_3 - 2x_1}{10}, x_3 = \frac{12 + 3x_2 - 5x_1}{10}$$

n	x_1	x_2	x_3
①	1.3	1.5	1.2
②	0.91	0.88	1
③	1.012	1.018	1.009
④	0.9964	0.9949	0.9994
⑤	1.00063	1.0009	1.00027
	$E = 4.23 \times 10^{-3}$	$E = 6 \times 10^{-3}$	$E = 8.7 \times 10^{-4}$



$$\begin{aligned} x_1 &= 1.00063 \\ x_2 &= 1.00090 \\ x_3 &= 1.00027 \end{aligned}$$

Major Task

Total: 30 marks

PHM 114: Numerical Analysis

Name: Omar Alaa Elhachimi ID.: 21.Po.197 Section: L4

System of Linear Equations

(9) Apply Gauss Seidel method to find the approximate solution of the system:

$$2x_1 + 10x_2 + 3x_3 = 15$$

$$10x_1 + x_2 + 2x_3 = 13$$

$$5x_1 - 3x_2 + 10x_3 = 12 \text{ to within an accuracy of } 0.01.$$

$x_1 = 0, x_2 = 0, x_3 = 0 \Rightarrow$ Initial Approx.

$$x_1 = \frac{13 - x_2 - 2x_3}{10}$$

$$x_2 = \frac{15 - 2x_1 - 3x_3}{10}$$

$$x_3 = \frac{12 - 5x_1 + 3x_2}{10}$$

n	x_1	x_2	x_3
①	1.3	1.5	1.2
②	0.93	0.954	1.0212
③	1.00036	0.993568	0.9978904
④	1.001065	1.00042	0.999593
	$E = 7.05 \times 10^{-4}$	$E = 6.852 \times 10^{-3}$	$E = 1.7026 \times 10^{-3}$

Answer: $x_1 = 1.0011$
 $x_2 = 1.0004$
 $x_3 = 0.9996$