TECNOLÓGICO DE ESTUDIOS SUPERIORES DE ECATEPEC

División de ingeniería en Sistemas Computacionales

"Ejercicios"

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Grupo: 5501

De los siguientes sistemas de ecuaciones, obtener la solución realizando

- 4 iteraciones completas utilizando Jacobi
- 4 iteraciones completas utilizando Gauss - Saidel
- Realizar los programas donde se grafique el valor de cada variable y la evolución a lo largo de las iteraciones

1) $9x + 2y - z = -2$
$7x + 8y + 5z = 3$
$3x + 4y - 10z = 6$

$x = -2/9 - 2/9 y - 1/9 z$
$y = 3/8 - 7/8 x - 5/8 z$
$z = 6/-10 - 3/-10 x - 4/-10 y$

2) $5x_1 + 2x_2 = 12$
$-x_1 + 10x_2 = 8$

$x_1 = \frac{12}{5} - \frac{2}{5} x_2$
$x_2 = 8/10 + 1/10 x_1$

3) $8x_1 + x_2 = 4$
$2x_1 + 5x_2 = 3$
$x_1 + 4x_3 = 3$

$x_1 = 4/8 - 1/8 x_2$
$x_2 = 3/5 - 2/5 x_1$
$x_3 = 3/4 - 1/4 x_1$

4) $6x_1 + 2x_2 + x_3 = 22$
$-x_1 + 8x_2 + 2x_3 = 20$
$x_1 - x_2 + 6x_3 = 23$

$x_1 = 22/6 - 2/6 x_2 - 1/6 x_3$
$x_2 = 20/8 + 1/8 x_1 - 3/8 x_3$
$x_3 = 23/6 - 1/6 x_1 + 1/6 x_2$

Metodo de Jacobi

Ejercicio 1

$x_1 = -3/9 - 2/9\,x_2 - 1/9\,x_3$ $\quad x_{1_0} = 0$

$x_2 = 3/8 - 7/8\,x_1 - 5/8\,x_3$ $\quad x_{2_0} = 0$

$x_3 = 6/-10 - 3/-10\,x_1 - 4/-10\,x_2$ $\quad x_{3_0} = 0$

1ra iteración

$x_1 = -3/9 - 2/9\,(0) - 1/9\,(0)$ $\quad x_{1_1} = -3/9$ ó -0.2222

$x_2 = 3/8 - 7/8\,(0) - 5/8\,(0)$ $\quad x_{2_1} = 3/8$ ó 0.375

$x_3 = 6/-10 - 3/-10(0) - 4/-10(0)$ $\quad x_{3_1} = 6/-10$ ó -0.6

2da iteración

$x_1 = -3/9 - 2/9\,(0.375) - 1/9\,(-0.6)$ $\quad x_{1_2} = -0.2388$

$x_2 = 3/8 - 7/8\,(-0.2222) - 5/8\,(-0.6)$ $\quad x_{2_2} = 0.9444$

$x_3 = 6/-10 - 3/-10(-0.2222) - 4/-10(0.375)$ $\quad x_{3_2} = -0.5166$

3ra iteración

$x_1 = -3/9 - 2/9\,(0.9444) - 1/9\,(-0.5166)$ $\quad x_{1_3} = -0.3746$

$x_2 = 3/8 - 7/8\,(-0.2388) - 5/8\,(-0.5166)$ $\quad x_{2_3} = 0.9069$

$x_3 = 6/-10 - 3/-10(-0.2388) - 4/-10(0.9444)$ $\quad x_{3_3} = -0.2438$

4ta iteracion

$x_1 = -3/9 - 2/9\,(0.9069) - 1/9\,(-0.2438)$ $\quad x_{1_4} = -0.3911$

$x_2 = 3/8 - 7/8\,(-0.3746) - 5/8\,(-0.2438)$ $\quad x_{2_4} = 0.8865$

$x_3 = 6/-10 - 3/-10(-0.3746) - 4/-10(0.9069)$ $\quad x_{3_4} = -0.3496$

Ejercicio 2

$x_1 = 12/5 - 2/5\, x_2$ $\quad x_{1_0} = 0$

$x_2 = 8/10 + 1/10\, x_1$ $\quad x_{2_0} = 0$

1ra iteración

$x_1 = 12/5 - 2/5\,(0)$ $\quad x_{1_1} = 12/5$ ó 2.4

$x_2 = 8/10 + 1/10\,(0)$ $\quad x_{2_1} = 8/10$ ó 0.8

2da iteración

$x_1 = 12/5 - 2/5\,(0.8)$ $\quad x_{1_2} = 2.08$

$x_2 = 8/10 + 1/10\,(2.4)$ $\quad x_{2_2} = 1.04$

3ra iteración

$x_1 = 12/5 - 2/5\,(1.04)$ $\quad x_{1_3} = 1.984$

$x_2 = 8/10 + 1/10\,(2.08)$ $\quad x_{2_3} = 1.008$

4ta iteración

$x_1 = 12/5 - 2/5\,(1.008)$ $\quad x_{1_4} = 1.9968$

$x_2 = 8/10 + 1/10\,(1.984)$ $\quad x_{2_4} = 0.9984$

Ejercicio 3

$x_1 = 4/8 - 1/8\, x_2$

$x_2 = 3/5 - 2/5\, x_1$

$x_3 = 3/4 - 1/4\, x_1$

$x_{1_0} = 0$

$x_{2_0} = 0$

$x_{3_0} = 0$

1ra iteración

$x_1 = 4/8 - 1/8\,(0)$ $\quad x_{1_1} = 0.5$

$x_2 = 3/5 - 2/5\,(0)$ $\quad x_{2_1} = 0.6$

$x_3 = 3/4 - 1/4\,(0)$ $\quad x_{3_1} = 0.75$

2da iteración

$x_1 = 4/8 - 1/8\,(0.6)$ $\quad x_{1_2} = 0.35$

$x_2 = 3/5 - 2/5\,(0.5)$ $\quad x_{2_2} = 0.3999$

$x_3 = 3/4 - 1/4\,(0.5)$ $\quad x_{3_2} = 0.625$

3ra iteración

$x_1 = 4/8 - 1/8\,(0.3999)$ $\quad x_{1_3} = 6.4$

$x_2 = 3/5 - 2/5\,(0.4)$ $\quad x_{2_3} = 0.4599$

$x_3 = 3/4 - 1/4\,(0.4)$ $\quad x_{3_3} = 0.6625$

4ta iteracion

$x_1 = 4/8 - 1/8\,(0.4599)$ $\quad x_{1_4} = 0.385$

$x_2 = 3/5 - 2/5\,(0.4)$ $\quad x_{2_4} = 0.4599$

$x_3 = 3/4 - 1/4\,(0.4)$ $\quad x_{3_4} = 0.65$

Ejercicio 4

$x_1 = 22/6 - 2/6\,x_2 - 1/6\,x_3$ $\quad x_{1_0} = 0$

$x_2 = 20/8 + 1/8\,x_1 - 2/8\,x_3$ $\quad x_{2_0} = 0$

$x_3 = 23/6 - 1/6\,x_1 + 1/6\,x_2$ $\quad x_{3_0} = 0$

1ra iteracion

$x_1 = 22/6 - 2/6\,(0) - 1/6\,(0)$ $\quad x_{1_1} = 22/6$ ó 3.6666

$x_2 = 20/8 + 1/8\,(0) - 2/8\,(0)$ $\quad x_{2_2} = 20/8$ ó 2.5

$x_3 = 23/6 - 1/6\,(0) + 1/6\,(0)$ $\quad x_{3_2} = 23/6$ ó 3.8333

2da iteración

$x_1 = 22/6 - 2/6\,(2.5) - 1/6\,(3.8333)$ $\quad x_{1_2} = 2.1944$

$x_2 = 20/8 + 1/8\,(3.6666) - 3/8\,(3.8333)$ $\quad x_{2_2} = 1.5208$

$x_3 = 23/6 - 1/6\,(3.6666) + 1/6\,(2.5)$ $\quad x_{3_2} = 3.6388$

3ra iteración

$x_1 = 22/6 - 2/6\,(1.5208) - 1/6\,(3.6388)$ $\quad x_{1_3} = 2.5532$

$x_2 = 20/8 + 1/8\,(2.1944) - 2/8\,(3.6388)$ $\quad x_{2_3} = 1.4097$

$x_3 = 23/6 - 1/6\,(2.1944) + 1/6\,(1.5208)$ $\quad x_{3_3} = 3.7210$

4ta iteración

$x_1 = 22/6 - 2/6\,(1.4097) - 1/6\,(3.7210)$ $\quad x_{1_4} = 2.5765$

$x_2 = 20/8 + 1/8\,(2.5532) - 2/8\,(3.7210)$ $\quad x_{2_4} = 1.4237$

$x_3 = 23/6 - 1/6\,(2.5532) + 1/6\,(1.4097)$ $\quad x_{3_4} = 3.6427$

Metodo de Gauss-Seidel

Ejercicio 1

$x_n = -3/9 - 2/9\, y - 1/9\, z$ $\quad x_0 = 0$

$y_n = 3/8 - 7/8\, x_{n-1} - 5/8\, z$ $\quad y_0 = 0$

$z_n = 6/-10 - 3/-10\, x_{n-1} - 4/-10\, y_{n-1}$ $\quad z_0 = 0$

1ra iteración

$x = -3/9 - 2/9(0) - 1/9(0)$ $\quad x_1 = -0.2222$

$y = 3/8 - 7/8(-0.2222) - 5/8(0)$ $\quad y_1 = 0.5694$

$z = 6/-10 - 3/-10(-0.2222) - 4/-10(0.5964)$ $\quad z_1 = -0.4388$

2da iteración

$x = -3/9 - 2/9(0.5694) - 1/9(-0.4388)$ $\quad x_2 = -0.3$

$y = 3/8 - 7/8(-0.3) - 5/8(-0.4388)$ $\quad y_2 = 0.9118$

$z = 6/-10 - 3/-10(-0.3) - 4/-10(0.9118)$ $\quad z_2 = -0.3252$

3ra iteración

$x = -3/9 - 2/9(0.9118) - 1/9(-0.3252)$ $\quad x_3 = -0.3887$

$y = 3/8 - 7/8(-0.3887) - 5/8(-0.3252)$ $\quad y_3 = 0.9184$

$z = 6/-10 - 3/-10(-0.3887) - 4/-10(0.9184)$ $\quad z_3 = -0.3492$

4ta iteración

$x = -3/9 - 2/9(0.9184) - 1/9(-0.3492)$ $\quad x_4 = -0.3875$

$y = 3/8 - 7/8(-0.3875) - 5/8(-0.3492)$ $\quad y_4 = 0.9323$

$z = 6/-10 - 3/-10(-0.3875) - 4/-10(0.9323)$ $\quad z_4 = -0.3933$

Ejercicio 2

$x_1 = 12/5 - 2/5\, x_2$ $\quad x_{1_0} = 0$

$x_2 = 8/10 + 1/10\, x_{1-1}$ $\quad x_{2_0} = 0$

1ra iteracion

$x_1 = 12/5 - 2/5\,(0)$ $\quad x_{1_1} = 2.4$

$x_2 = 8/10 + 1/10\,(2.4)$ $\quad x_{2_1} = 1.04$

2da iteración

$x_1 = 12/5 - 2/5\,(1.04)$ $\quad x_{1_2} = 1.984$

$x_2 = 8/10 + 1/10\,(1.984)$ $\quad x_{2_2} = 0.9984$

3ra iteracion

$x_1 = 12/5 - 2/5\,(0.9984)$ $\quad x_{1_3} = 2.0006$

$x_2 = 8/10 + 1/10\,(2.0006)$ $\quad x_{2_3} = 1$

4ta iteración

$x_1 = 12/5 - 2/5\,(1)$ $\quad x_{1_4} = 1.9999$

$x_2 = 8/10 + 1/10\,(1.9999)$ $\quad x_{2_4} = 0.9999$

Ejercicio 3

$x_1 = 4/8 - 1/8\, x_2$

$x_2 = 3/5 - 2/5\, x_{1-1}$

$x_3 = 3/4 - 1/4\, x_{1-1}$

$x1_0 = 0$

$x2_0 = 0$

$x3_0 = 0$

1ra iteración

$x_1 = 4/8 - 1/8\,(0)$ $\quad x1_1 = 0.5$

$x_2 = 3/5 - 2/5\,(0.5)$ $\quad x2_1 = 0.3999$

$x_3 = 3/4 - 1/4\,(0.5)$ $\quad x3_1 = 0.625$

2da iteración

$x_1 = 4/8 - 1/8\,(0.3999)$ $\quad x1_2 = 0.45$

$x_2 = 3/5 - 2/5\,(0.45)$ $\quad x2_2 = 0.4199$

$x_3 = 3/4 - 1/4\,(0.45)$ $\quad x3_2 = 0.6375$

3ra iteración

$x_1 = 4/8 - 1/8\,(0.4199)$ $\quad x1_3 = 0.4475$

$x_2 = 3/5 - 2/5\,(0.4475)$ $\quad x2_3 = 0.4209$

$x_3 = 3/4 - 1/4\,(0.4475)$ $\quad x3_3 = 0.6381$

4ta iteración

$x_1 = 4/8 - 1/8\,(0.4209)$ $\quad x1_4 = 0.4473$

$x_2 = 3/5 - 2/5\,(0.4473)$ $\quad x2_4 = 0.4210$

$x_3 = 3/4 - 1/4\,(0.4473)$ $\quad x3_4 = 0.6381$

Ejercicio 4

$x_1 = 23/6 - 2/6\,x_2 - 1/6\,x_3$ $\quad x_{1_0} = 0$

$x_2 = 20/8 + 1/8\,x_{1-1} - 3/8\,x_3$ $\quad x_{2_0} = 0$

$x_3 = 23/6 - 1/6\,x_{1_1} + 1/6\,x_{2-1}$ $\quad x_{3_0} = 0$

1ra iteración

$x_1 = 23/6 - 2/6\,(0) - 1/6\,(0)$ $\quad x_{1_1} = 3.6666$

$x_2 = 20/8 + 1/8\,(3.6666) - 3/8\,(0)$ $\quad x_{2_1} = 2.4583$

$x_3 = 23/6 - 1/6\,(3.6666) - 1/6\,(2.4583)$ $\quad x_{3_1} = 3.7152$

2da iteración

$x_1 = 23/6 - 2/6\,(2.4583) - 1/6\,(3.7152)$ $\quad x_{1_2} = 2.0613$

$x_2 = 20/8 + 1/8\,(2.0613) - 3/8\,(3.7152)$ $\quad x_{2_2} = 1.3644$

$x_3 = 23/6 - 1/6\,(2.0613) + 1/6\,(1.3644)$ $\quad x_{3_2} = 3.7171$

3ra iteración

$x_1 = 23/6 - 2/6\,(1.3644) - 1/6\,(3.7171)$ $\quad x_{1_3} = 2.5923$

$x_2 = 20/8 + 1/8\,(2.5923) - 3/8\,(3.7171)$ $\quad x_{2_3} = 1.43$

$x_3 = 23/6 - 1/6\,(2.5923) + 1/6\,(1.43)$ $\quad x_{3_3} = 3.6396$

4ta iteración

$x_1 = 23/6 - 2/6\,(1.43) - 1/6\,(3.6396)$ $\quad x_{1_4} = 2.5833$

$x_2 = 20/8 + 1/8\,(2.5833) + 1/8\,(3.6396)$ $\quad x_{2_4} = 1.4580$

$x_3 = 23/6 - 1/6\,(2.5833) + 1/6\,(1.4580)$ $\quad x_{3_4} = 3.6457$