CS ASSIGNMENT

1) Solve the follow. linear system of eq's using Jacobi iteration method

$$5x + 2y + z = 12$$
$$x + 4y + 2z = 15$$
$$x + 2y + 5z = 20$$

1) Taking initial approximation → (2, 2, 2)

1st iteration

$$x_1 = \frac{1}{5}[12 - 2y_0 - z_0]$$

$$y_1 = \frac{1}{4}[15 - x_0 - 2z_0]$$

$$z_1 = \frac{1}{5}[20 - x_0 - 2y_0]$$

$$\Rightarrow x_1 = \frac{1}{5}[12 - 2(2) - 2] = 1.2$$

$$y_1 = \frac{1}{4}[15 - 2 - 2(2)] = 2.25$$

$$z_1 = \frac{1}{5}[20 - 2 - 2(2)] = 2.8$$

2nd iteration

$$x_2 = \frac{1}{5}[12 - 2(2.25) - 2.8] = 0.94$$

$$y_2 = \frac{1}{4}[15 - (1.2) - 2(2.8)] = 2.05$$

$$z_2 = \frac{1}{5}[20 - (1.2) - 2(2.25)] = 2.86$$

Similarly,

3rd iteration :-

$x_3 = 1.008$
$y_3 = 2.085$
$z_3 = 2.922$

4th iteration :-

$x_4 = 0.9676$
$y_4 = 2.002$
$z_4 = 2.9644$

5th iteration :-

$x_5 = 1.0063$
$y_5 = 2.0259$
$z_5 = 3.0057$

6th iteration :-

$x_6 = 0.9885$
$y_6 = 1.9956$
$z_6 = 2.9884$

7th iteration :-

$x_7 = 1.0041$
$y_7 = 2.0087$
$z_7 = 3.0041$

8th iteration :-

$x_8 = 0.9957$
$y_8 = 1.9969$
$z_8 = 2.9957$

9th iteration :-

$x_9 = 1.0021$
$y_9 = 2.0032$
$z_9 = 3.0021$

10th iteration :-

$x_{10} = 0.9983$
$y_{10} = 1.9984$
$z_{10} = 2.9983$

11th iteration :-

$x_{11} = 1.001$
$y_{11} = 2.0013$
$z_{11} = 3.001$

12th iteration :-

$x_{12} = 0.9993$
$y_{12} = 1.9993$
$z_{12} = 2.9993$

13th iteration :-

$x_{13} = 1.0004$
$y_{13} = 2.0005$
$z_{13} = 3.0004$

14th iteration :-

$x_{14} = 0.9997$
$y_{14} = 1.9997$
$z_{14} = 2.9997$

So, the soln is $(0.9997, 1.9997, 2.9997)$

$\approx (1, 2, 3)$

(2) Solve the follow linear system of eq^n's using Gauss Seidal method

$10x + y + z = 12$
$2x + 10y + z = 13$
$2x + 2y + 10z = 14$

(2) Taking inital approximation → $(0, 0, 0)$

1st iteration

$x_1 = \frac{1}{10}[12 - y_0 - z_0] = \frac{1}{10}[12 - 0 - 0] = 1.2$

$y_1 = \frac{1}{10}[13 - 2x_0 - z_0] = \frac{1}{10}[13 - 2(1.2) - 0] = 1.06$

$z_1 = \frac{1}{10}[14 - 2x_0 - 2y_0] = \frac{1}{10}[14 - 2(1.2) - 2(1.06)] = 0.948$

2nd iteration

$x_2 = \frac{1}{10}[12 - 1.06 - 0.948] = 0.9992$

$y_2 = \frac{1}{10}[13 - 2(0.992) - (0.948)] = 1.0054$

$z_2 = \frac{1}{10}[14 - 2(0.992) - 2(1.0054)] = 0.9991$

3rd iteration :—

$$x_3 = \frac{1}{10}[12 - 1.0054 - 0.9991] = 0.9996$$

$$y_3 = \frac{1}{10}[13 - 2(0.9996) - 0.9991] = 1.0002$$

$$z_3 = \frac{1}{10}[14 - 2(0.9996) - 2(1.0002)] = 1.0001$$

4th iteration :—

$$x_4 = \frac{1}{10}[12 - 1.0002 - 1.0001] = \frac{9.9998}{10} \simeq 1$$

$$y_4 = \frac{1}{10}[13 - 2(1) - (1.0001)] \simeq 1$$

$$z_4 = \frac{1}{10}[14 - 2(1) - 2(1.0001)] \simeq 1$$

So, the sol^n is $\simeq (1, 1, 1)$

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