ENGINEERING MATHEMATICS

ALL BRANCHES

Numerical Methods

Numerical Solution of Linear Equation

DPP-01 Solution

By- CHETAN SIR

Question 1

Solve the following equations by Jacobi method

$20x + y - 2z = 17;$

$3x + 20y - z = -18;$

$2x - 3y + 20z = 25$

Assuming initial guess $x_0 = y_0 = z_0 = 0$, the value of x after first approximation is 0.85

$$x = \frac{1}{20}(17 - y - 2z)$$

$$= \frac{1}{20}(17 - 0 - 2 \times 0) = 0.85$$

Question 2

Solve the system of equations by Gauss-Seidal interactive method

$54x + y + z = 110$

$2x + 15y + 6z = 72$

$-x + 6y + 27z = 85$

What is the value of z after second approximation?

$x = \frac{1}{54}(110 - y - z)$

$y = \frac{1}{15}(72 - 2x - 6z)$

$z = \frac{1}{27}(85 + x - 6y)$

		1st	2nd
x	0	2.037	1.912
y	0	4.528	3.658
z	0	2.217	2.406

Question 3

Solve by Jacobi's method.

Assuming initial guess $x_0 = y_0 = z_0 = 0$, the value of y after first approximation is _____

$4x + y + 3z = 17;$

$x + 5y + z = 14;$

$2x - y + 8z = 12$

$y = \frac{1}{5}(14 - x - z)$

$\frac{14}{5}$

Question 4

Solve the following system of equations using Gauss-Seidal interactive method

$2x + 10y + z = 51$

$10x + y + 2z = 44$

$x + 2y + 10z = 61$

$10x + y + 2z = 44$

$2x + 10y + z = 51$

$x + 2y + 10z = 61$

What is the value of z after first approximation?

$x = \frac{1}{10}(44 - y - 2z)$

$y = \frac{1}{10}(51 - 2x - z)$

$z = \frac{1}{16}(61 - x - 2y)$

		1st
x	0	4.4
y	0	4.22
z	0	4.816

Question 5

Use Gauss-Seidal interactive method to solve the following equations as

$9x + 4y + z = -17$

$x - 2y - 6z = 14$

$x + 6y = 4$

$9x + 4y + z = -17$

$x + 6y = 4$

$x - 2y - 6z = 14$

What is the value of y after second approximation?

$x = \frac{1}{9}(-17 - 4y - z)$

$y = \frac{1}{6}(4 - x)$

$z = \frac{1}{6}(x - 2y - 14)$

		1st	2nd
x	0	-1.88	-1.9945
y	0	0.9815	0.9991
z	0	-2.9753	-2.9988

Question 6

Gauss-Seidel method is used to solve the following equations (as per the given order):

$x_1 + 2x_2 + 3x_3 = 5$

$2x_1 + 3x_2 + x_3 = 1$

$3x_1 + 2x_2 + x_3 = 3$

Assuming initial guess as $x_1 = x_2 = x_3 = 0$, the value of x_3 after the first iteration is -6.

$\rightarrow x_1 + 2(0) + 3(0) = 5 \rightarrow x_1 = 5$

$\rightarrow 2(5) + 3x_2 + 0 = 1 \rightarrow x_2 = -3$

$\rightarrow 3(5) + 2(-3) + x_3 = 3 \rightarrow \boxed{x_3 = -6}$

Question 7

The approximate solution of the system of simultaneous equations

$5x - 2y + z = -1$

$3x + 4y - 2z = 2$

$4x - y + 3z = 4$

by applying Gauss-Jacobi method one time (using initial approximation) as $x = 0, y = 0, z = 0$) will be:

A $x = 1.25, y = 2.275, z = -3.72$

B $x = -1.5, y = 3.25, z = 1.275$

C $x = 1.5, y = -2.375, z = 2.234$

D $x = -0.2, y = 0.5, z = 1.33$

Question 8

Solve by Gauss-Seidal method, the following system

$28x + 4y - z = 32;$

$x + 3y + 10z = 24;$

$2x + 17y + 4z = 35$

$28x + 4y - z = 32$

$2x + 17y + 4z = 35$

$x + 3y + 10z = 24$

What is the value of z after second approximation?

$x = \frac{1}{28}(32 - 4y + z)$

$y = \frac{1}{17}(35 - 2x - 4z)$

$z = \frac{1}{10}(24 - x - 3y)$

		1st	2nd
x	0	1.1429	0.9325
y	0	1.9244	1.5236
z	0	1.8084	1.8497

Thank you

GW

Soldiers !