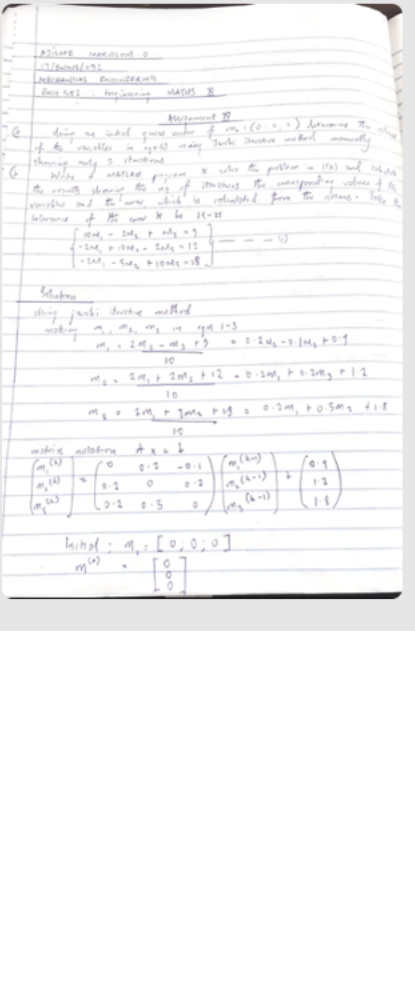
Scanned Documents



Assignment 10

Q Using an initial guess vector of $x_0 = (0, 0, 0)$ determine the values of the variables in eqn (1) using Jacobi iterative method numerically showing only 2 iterations

Q Write MATLAB program to solve the problem in (1a) and validate the results showing the no. of iterations the corresponding values of the variables and the norm which is calculated from the formula. Take a tolerance of the norm to be 10^{-15}

$$\begin{cases} 10x_1 - 2x_2 + x_3 = 7 \\ -2x_1 + 10x_2 - x_3 = 12 \\ -2x_1 - 5x_2 + 10x_3 = 18 \end{cases} \quad \text{---(1)}$$

Solution

using Jacobi iterative method

making x_1, x_2, x_3 in eqn 1-3

$$x_1 = \frac{2x_2 - x_3 + 7}{10} = 0.2x_2 - 0.1x_3 + 0.7$$

$$x_2 = \frac{2x_1 + x_3 + 12}{10} = 0.2x_1 + 0.1x_3 + 1.2$$

$$x_3 = \frac{2x_1 + 5x_2 + 18}{10} = 0.2x_1 + 0.5x_2 + 1.8$$

matrix notation $A x = b$

$$\begin{bmatrix} x_1^{(k)} \\ x_2^{(k)} \\ x_3^{(k)} \end{bmatrix} = \begin{bmatrix} 0 & 0.2 & -0.1 \\ 0.2 & 0 & 0.2 \\ 0.2 & 0.5 & 0 \end{bmatrix} \begin{bmatrix} x_1^{(k-1)} \\ x_2^{(k-1)} \\ x_3^{(k-1)} \end{bmatrix} + \begin{bmatrix} 0.7 \\ 1.2 \\ 1.8 \end{bmatrix}$$

Initial : $x_0 = [0, 0, 0]$

$$x^{(0)} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$