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PRN :- 23620005
Assignment :- LUP Decomposition.

Observation :-

- The task involves solving 8 variable system of simultaneous equation using LUP decomposition method.
- Given, - matrix, of size 8×8. representing the coefficients of equations, vector b represents right-hand side value [Constants].
- Goal, - To decompose matrix A into lower triangular (L), & permutation (P) matrices, & then solve system $Ax = b$ efficiently.

$$[A] = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

Decompose.

$$[A] = [L][U] \begin{bmatrix} 1 & 0 & 0 \\ L_{21} & 1 & 0 \\ L_{31} & L_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$= \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

- Process of solving uses forward & backward substitution
- Matlab implementation closely follow logic of c++ version but adapts to Matlab's matrix handling. The runtime is measured using "tic" & "toc" function. [Runtime : 0.001851 seconds]