LU Decomposition

Gauss elimination has a parts

(i) Transforming the coefficient

matrix to an upper triangular

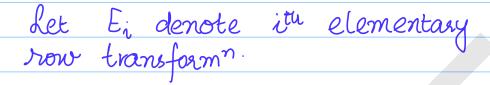
form with forward elimination

(ii) Back Substitution.

AZ:6

 $a_{11} x_1 + a_{12} x_2 + a_{13} x_3 = b_1$ $a_{21} x_1 + a_{22} x_2 + a_{23} x_3 = b_2$ $a_{31} x_1 + a_{32} x_2 + a_{33} x_3 = b_3$

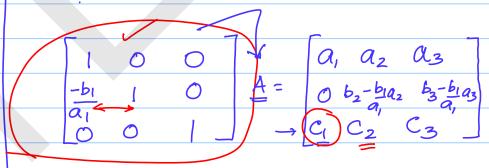
Už = 6* Applying elementary row transformations to the augmented matrix $a_{11} \ a_{12} \ a_{13}$ $a_{22} \ a_{23}$ an aiz aiz azi azz azz , we had 0 0 0 3 931 932 933 a₁₃ 61 61 a_{12} an 61 0 Q₂₂ 0 0 0^{*}₂₃ 0^{*}₃₃ b* b* b2 b3



$$E_{n-1} \cdot \cdot \cdot E_3 E_2 E_1 A = \mathcal{U}$$

$$A = \begin{bmatrix} a_1 & a_2 & a_3 & \\ b_1 & b_2 & b_3 & \rightarrow \mathcal{U} \\ \hline c_1 & c_2 & c_3 & & \end{bmatrix}$$

$$R_2 \leftarrow R_2 - \frac{b_1}{a_1} R_1 \qquad a_1 \neq 0.$$



 E_{n-1} · · · · · E_2 E_1 A = u

U: Upper triangular Matrix

 $A = \begin{bmatrix} E_1^{-1}E_2^{-1} & E_{n-1} \end{bmatrix} \mathcal{U}$

A: LU L: Lower Dar Uatrix.

Ax = b

LUx = b

Ux = y

$\begin{bmatrix} u_{11} & u_{12} & u_{13} & \begin{bmatrix} x_1 & y_1 \end{bmatrix} \end{bmatrix}$	LU decomposition.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
	U11 U12 U13
we get the values of χ_1, χ_2, χ_3	0 U22 U23 0 U33.
Loy back Substitution.	1 0 0 an an an
	$l_{21} l 0 a_{21} a_{22} a_{23} $
	la la 1 a a a a a a a a a a a a a a a a

Given $a_{i,j}$, we need to find

Out $l_{i,j}$ & $l_{i,j}$ The elements of A below the diagonal can be written as $a_{i,j} = l_{i,i} u_{i,j} + ... + l_{i,j-1} u_{j-1,j} + l_{i,j} u_{j,j} + l_{i,j} u_{j,j}$

 $Ai,j = l_i, u,j + \dots + l_i, i-1, u_{i-1}, j+l_{ij}u_{ij}$ for j > i

 $l_{\tilde{x},\tilde{y}} = \frac{1}{u_{jj}} \left(a_{ij} - l_{i,1} u_{i,j} - \cdots - l_{i,j-1} u_{j-1,j} \right) j < i$

Uij = aij - li,141, j - ··· - li,i-1 Ui-1,j j≥i