## Step-1

(b)

The objective is to find the matrix  $M = E_{31}P_{23}$  if  $E_{31}$  subtracts row 1 from row 2 and then

 $P_{23}$  Exchanges rows 2 and 3 of matrix I.

$$P_{23} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

Therefore

 $E_{31}$  Subtracts row 1 from row3

$$E_{31} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix}$$

Therefore

Now by definition  $M = E_{31}P_{23}$ 

$$M = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1 & 1 & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$
$$= \begin{pmatrix} 1 & 0 & 0 \\ -1 & 0 & 1 \\ -1 & 1 & 0 \end{pmatrix}$$

Here M  $\hat{\mathbf{a}} \in \mathbb{T}^{\mathbf{M}}$ s same but the E  $\hat{\mathbf{a}} \in \mathbb{T}^{\mathbf{M}}$ s are different because both steps can $\hat{\mathbf{a}} \in \mathbb{T}^{\mathbf{M}}$ t do at once because in  $E_{31}$  and  $E_{23}$  the second row involve.