Step-1

(a)

Consider the 3 by 3 matrix:

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

The objective is to write a 3 by 3 matrix E_{13} will add row 3 to row1.

Step-2

Consider $I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Add row 3 to row 1 then to get the matrix E_{13}.

Therefore, $E_{13} = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$.

Step-3

(b)

The objective is to write what matrix adds row1 to row 3 and at the same time adds row 3 to row1.

Consider the matrix:

$$I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

Now adds row 1 to row3 and at the same time adds row 3 to row 1 is as follows:

The matrix that adds row 1 to row 3 is,

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

And at the same time the matrix that adds row 3 to row 1 is,

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

Step-4

(c)

The objective is to write what matrix adds row 1 to row 3 and then adds row 3 to row 1.

Consider the matrix:

$$I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

The matrix that adds row 1 to row 3 is,

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

And then the matrix that adds row 3 to row 1 is,

$$\begin{pmatrix} 2 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$