

Step-1

Let us consider the 5×5 matrix A with 1s just above and below the main diagonal as shown below.

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

Step-2

(a) Let us consider a set of rows with 1s in too few columns:

From the matrix A , it is observed that rows 1, 3, and 5 only have 1s in columns 2 and 4.

Step-3

(b) Let us consider a set of columns with 1s in too few rows:

From the matrix A , it is observed that columns 1, 3, and 5 only have 1s in rows 2 and 4.

Step-4

(c) Let us consider a p by q sub-matrix of zeros with $p+q > 5$:

From the matrix A , it is observed that sub-matrix of zeros formed by rows 1, 3, and 5 and columns 1, 3, and 5 has all zeros such that

$$\begin{aligned} p+q &= 3+3 \\ &= 6 \\ &> 5 \end{aligned}$$

Step-5

(d) Let us consider the four lines that cover all the 1s.

From the matrix A , it is observed that rows 2, 4 and columns 2, 4 covers all 1s.