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$$x = \begin{bmatrix} x_1 \\ x_2 \\ v_1 \\ x_3 \\ v_2 \\ v_3 \end{bmatrix}$$

1]

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

2]

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

3] Multiplication components of $x_1\ x_2\ x_3$ from signal vector x while setting all other components to be zero

4]

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_4 \end{bmatrix} + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_3 \\ v_5 \\ v_6 \end{bmatrix}$$

5] $D = [1\ -2\ 1\ 0\ 0\ 0]\ x_{y_1}$

$+ [0\ 1\ -2\ 1\ 0\ 0]\ x_{y_2}$ . . . . . .

$$\begin{bmatrix} 0 & 0 & 0 & 1 & -2 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{matrix} y_5 \\ y_6 \end{matrix}$$

$$\begin{bmatrix} y_1 - 2y_2 + y_3 \\ y_2 - 2y_3 + y_2 \\ y_3 - 2y_1 + y_3 \\ y_4 - 2y_5 + y_6 \end{bmatrix}$$

$$y = \begin{bmatrix} 15 \\ 30 \\ 10 \\ 25 \\ 5 \\ 30 \end{bmatrix} = \begin{bmatrix} 15 - 60 + 10 \\ 30 - 20 + 25 \end{bmatrix}$$

$$= \begin{bmatrix} -35 \\ 35 \\ -35 \\ 95 \end{bmatrix}$$