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Ans to the ques no: 1

$$x_1 + 2x_2 - 3x_3 + 4x_4 = 2$$
$$2x_1 + 5x_2 - 2x_3 + x_4 = 1$$
$$5x_1 + 12x_2 - 7x_3 + 6x_4 = 3$$

$$\begin{bmatrix} 1 & 2 & -3 & 4 & 2 \\ 2 & 5 & -2 & 1 & 1 \\ 5 & 12 & -7 & 6 & 3 \end{bmatrix}$$ ← The augmented matrix for the system.

$$\begin{bmatrix} 1 & 2 & -3 & 4 & 2 \\ 0 & 1 & 4 & -7 & -3 \\ 0 & 2 & 8 & -14 & -7 \end{bmatrix}$$ ← $\pi_2' = \pi_2 - 2\pi_1$, $\pi_3' = \pi_5 - 5\pi_1$

$$\begin{bmatrix} 1 & 0 & -11 & 18 & 8 \\ 0 & 1 & 4 & -7 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{bmatrix}$$ ← $\pi_1' = \pi_1 - 2\pi_2$, $\pi_3 - \pi_3 - 2\pi_2$

∴ The augmented matrix is inconsistent

(Ans)

(2)

$$A^2 + 2A + tra\, A^T$$

$$A = \begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$A^2 = \begin{bmatrix} 5 & -2 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix} \begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$= \begin{bmatrix} 75 & -89 & -13 \\ -89 & 117 & 1 \\ -13 & 1 & 21 \end{bmatrix}$$

$$2A = 2\begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$= \begin{bmatrix} 10 & -14 & 2 \\ -14 & 16 & 4 \\ 2 & 4 & -8 \end{bmatrix}$$

$$A^T = \begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$\therefore tra(A^T) = \begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$\therefore A^2 + 2A + tra(A^T) = \begin{bmatrix} 75 & -89 & -13 \\ -89 & 117 & 1 \\ -13 & 1 & 21 \end{bmatrix} + \begin{bmatrix} 10 & -14 & 2 \\ -14 & 16 & 4 \\ 2 & 4 & -8 \end{bmatrix} + \begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$= \begin{bmatrix} 90 & -110 & -10 \\ -110 & 141 & 7 \\ -10 & 7 & 9 \end{bmatrix} \quad (Ans)$$