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Ans. to ques. - 1

The augmented matrix is:

$$\begin{bmatrix} 1 & 2 & -3 & 4 & 2 \\ 2 & 5 & -2 & 1 & 1 \\ 5 & 12 & -7 & 6 & 3 \end{bmatrix}$$

Adding -2 times 1st row to 2nd row and adding -5 times 1st row to 3rd row:

$$\begin{bmatrix} 1 & 2 & -3 & 4 & 2 \\ 0 & 1 & 4 & -7 & -3 \\ 0 & 2 & 8 & -14 & -7 \end{bmatrix}$$

Adding ~~-1~~ -2 times 2nd row to 3rd row!

$$\begin{bmatrix} 1 & 2 & -3 & 4 & 2 \\ 0 & 1 & 4 & -7 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{bmatrix}$$

The last equation: $0x_1 + 0x_2 + 0x_3 + 0x_4 = -1$

$\Rightarrow 0 = -1$

Hence the system is inconsistent and there are no solutions. Ans

Ans. to ques. - 2

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

$$= \begin{bmatrix} 25+49+1 & -35-56+2 & 5-14-4 \\ -35-56+1 & 49+64+4 & -7+16-8 \\ 5-14-4 & -7+16-8 & 1+4+16 \end{bmatrix}$$

$$= \begin{bmatrix} 75 & -89 & -13 \\ -90 & 117 & 1 \\ -13 & 1 & 21 \end{bmatrix}$$

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

$$\text{tr}\, a(A^T) = 5 + 8 - 4 = 9$$

$\therefore A^2 + 2A + 2I_3 a(A^T)$

$$= \begin{bmatrix} 75 & -89 & -13 \\ -90 & 117 & 1 \\ -13 & 1 & 21 \end{bmatrix} + 2\begin{bmatrix} 5 & -7 & 1 \\ -7 & 8 & 2 \\ 1 & 2 & -4 \end{bmatrix}$$

$$+ 9\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 75 & -89 & -13 \\ -90 & 117 & 1 \\ -13 & 1 & 21 \end{bmatrix} + \begin{bmatrix} 10 & -14 & 2 \\ -14 & 16 & 4 \\ 2 & 4 & -8 \end{bmatrix}$$

$$+ \begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

$$= \begin{bmatrix} 94 & -103 & -11 \\ -104 & 142 & 5 \\ -11 & 5 & 22 \end{bmatrix}$$

Ans