

Q82 Let M be 3×3 matrix satisfying

$$M \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}, \quad M \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} \text{ and}$$

$$M \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 12 \end{bmatrix} \text{ then sum of the diagonal entries of } M \text{ is}$$

Solution 2 let $M = \begin{bmatrix} a & b & c \\ x & y & z \\ l & m & n \end{bmatrix}$ according to question

$$\begin{bmatrix} a & b & c \\ x & y & z \\ l & m & n \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$$

$$\therefore b = -1, \quad y = 2, \quad m = 3 \quad \text{--- (i)}$$

$$\begin{bmatrix} a & b & c \\ x & y & z \\ l & m & n \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$$

$$a - b = 1$$

$$x - y = 1$$

$$l - m = -1$$

from eqⁿ (i)

$$a = 0, \quad x = 3, \quad l = 2$$

$$\begin{bmatrix} a & b & c \\ x & y & z \\ d & m & n \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 12 \end{bmatrix}$$

$$\text{At } m + n = 12$$

$$2 + 3 + n = 12$$

$$n = 7$$

Now Sum of diagonal

$$a + y + n = 0 + 2 + 7 = 9$$