

T6

Q. If $M = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ - then find the value of λ such that

$$M^2 + \lambda M - 5I = 0$$

$$M^2 = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}_{2 \times 2} \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}_{2 \times 2} = \begin{bmatrix} 7 & 6 \\ 4 & 7 \end{bmatrix}$$

$$\begin{bmatrix} 7 & 6 \\ 4 & 7 \end{bmatrix} + \lambda \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix} - \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} = 0$$

$$\begin{bmatrix} 2 & 6 \\ 4 & 2 \end{bmatrix} + \begin{bmatrix} \lambda & 3\lambda \\ 2\lambda & \lambda \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\Rightarrow \begin{aligned} 2 + \lambda &= 0 \\ \Rightarrow \lambda &= -2 \end{aligned}$$

$$\Rightarrow \Rightarrow \begin{bmatrix} \lambda & 3\lambda \\ 2\lambda & \lambda \end{bmatrix} = \begin{bmatrix} -2 & -6 \\ -4 & -2 \end{bmatrix}$$

$$\therefore \lambda = -2 \text{ (Ans.)}$$