TOPIC
Mathematics – Section I – Question 15

QUESTION
If [B] is the inverse of

$$\begin{bmatrix} 2 & 5 \\ 4 & 13 \end{bmatrix}$$

then b_{22} most nearly is

(A) -5/6
(B) 1/13
(C) 1/3
(D) 13/6

HINT
The inverse [B] of the square matrix [A] is defined such that [B][A]=[I]

SOLUTION
The inverse [B] of the square matrix [A] is defined such that [B][A]=[I]. This also implies that [A][B]=[I].

Then

$$\begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} 2 & 5 \\ 4 & 13 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

which also implies that

$$\begin{bmatrix} 2 & 5 \\ 4 & 13 \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Then

$$\begin{bmatrix} 2 & 5 \\ 4 & 13 \end{bmatrix} \begin{bmatrix} b_{12} \\ b_{22} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

giving two equations and two unknowns as

$$2b_{12} + 5b_{22} = 0$$
$$4b_{12} + 13b_{22} = 1$$

giving

$$b_{22} = 1/3$$

ANSWER
(C)

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