Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Techonology Hyderabad

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Question 12.13.3.14 :
If A and B are two events such that A $\subset$ B and P(B) $\neq$ 0, then which of the following is correct?

Options:
(A)$P(A \mid B) = \frac{P(B)}{P(A)}$
(B)$P(A \mid B) < P(A)$
(C)$P(A \mid B) \geq P(A)$
(D)None of these

Answer: (C)

Solution:

As given in the question,

$$A \subset B \Rightarrow AB = A \tag{1}$$

$$\therefore P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)} \tag{2}$$

$$P(B) \neq 0 \text{ (Given)} \tag{3}$$

$$\therefore 0 < P(B) \leq 1 \Rightarrow \frac{1}{P(B)} \tag{4}$$

$\therefore$ Using equation (1) ,

$$P(A|B) = P(A) \times \frac{1}{P(B)} \geq P(A) \tag{5}$$

$\therefore$ $P(A \mid B) \geq$ P(A)
Hence, the correct option is (C).