

Assignment 2

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and latex-tikz codes from

<https://github.com/CS20BTECH11004/AI1103/blob/main/Assignment%202/Assignment%202.tex>

1 QUESTION

(GATE MA 1999 Q1.28) Two independent events E and F are such that $P(E \cap F) = \frac{1}{6}$, $P(E^c \cap F^c) = \frac{1}{3}$ and $P(E) > P(F)$. Then $P(E)$ is

- (A) $\frac{1}{2}$
- (B) $\frac{2}{3}$
- (C) $\frac{1}{3}$
- (D) $\frac{1}{4}$

2 SOLUTION

If E and F are independent

$$\begin{aligned} P(E \cap F) &= P(E)P(F) \\ &= \frac{1}{6} \end{aligned} \quad (2.0.1)$$

We know

$$\begin{aligned} P(E) + P(F) - P(E \cap F) &= 1 - P(E^c \cap F^c) \\ P(E) + P(F) &= \frac{5}{6} \end{aligned} \quad (2.0.2)$$

From (2.0.1) and (2.0.2)

$$P(E) \left(\frac{5}{6} - P(E) \right) = \frac{1}{6} \quad (2.0.3)$$

$$P(E) = \frac{1}{2} \text{ or } \frac{1}{3} \quad (2.0.4)$$

From (2.0.2), $P(E) = \frac{1}{2}$ satisfies $P(E) > P(F)$ while $P(E) = \frac{1}{3}$ does not.

$$\therefore P(E) = \frac{1}{2}$$

Solution: option (A)