

EE22BTECH11029 - Komakula Sreeja

Question 12.13.3.95

If A and B are independent events, then A' and B' are also independent.

Solution: Given that A and B are independent events.

$$\implies \Pr(AB) = \Pr(A) \Pr(B) \quad (1)$$

We know that

$$\Pr(A') = 1 - \Pr(A) \quad (2)$$

$$\Pr(B') = 1 - \Pr(B) \quad (3)$$

Demorgan's law states that:

$$\Pr(AB)' = \Pr(A' + B') \quad (4)$$

$$\Pr(A + B)' = \Pr(A'B') \quad (5)$$

For A' and B' , using the above properties we get:

$$\Pr(A'B') = \Pr(A') + \Pr(B') - \Pr(A' + B') \quad (6)$$

$$= 1 - \Pr(A) + 1 - \Pr(B) - \Pr(AB)' \quad (7)$$

$$= 2 - \Pr(A) - \Pr(B) - 1 + \Pr(AB) \quad (8)$$

$$= 1 - \Pr(A) - \Pr(B) + \Pr(A) \Pr(B) \quad (9)$$

$$= (1 - \Pr(A))(1 - \Pr(B)) \quad (10)$$

$$= (\Pr(A'))(\Pr(B')) \quad (11)$$

Hence, A' and B' are also independent vectors.

Therefore, the given statement is true.