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.

$$\implies Pr(A.B) = Pr(A).Pr(B) \tag{1}$$

We know that

$$Pr(A') = 1 - Pr(A) \tag{2}$$
$$Pr(B') = 1 - Pr(B) \tag{3}$$

Demorgan's law states that:

$$(Pr(A.B))' = Pr(A' + B') \tag{4}$$
$$(Pr(A + B))' = Pr(A'.B') \tag{5}$$

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

$$\begin{aligned} Pr(A'.B') &= Pr(A') + Pr(B') - Pr(A' + B') && (6)\\ &= 1 - Pr(A) + 1 - Pr(B) - (Pr(A.B))' && (7)\\ &= 2 - Pr(A) - Pr(B) - 1 + Pr(A.B) && (8)\\ &= 1 - Pr(A) - Pr(B) + Pr(A).Pr(B) && (9)\\ &= (1 - Pr(A)).(1 - Pr(B)) && (10)\\ &= Pr(A').Pr(B') && (11) \end{aligned}$$

Hence, A' and B' are also independent vectors.
Therefore, the given statement is true.