

Probability Assignment

G. Sai Harshith - EE22BTECH11022

Question : If A and B are mutually exclusive events, $\Pr(A) = 0.35$ and $\Pr(B) = 0.45$ then find

- 1) $\Pr(A')$
- 2) $\Pr(B')$
- 3) $\Pr(A + B)$
- 4) $\Pr(AB)$
- 5) $\Pr(AB')$
- 6) $\Pr(A'B')$

Solution: Given that A and B are mutually exclusive events. so, from third axiom of probability, we have

$$\Pr(AB) = 0 \quad (1)$$

We have

$$\Pr(A) = 0.35 \quad (2)$$

$$\Pr(B) = 0.45 \quad (3)$$

Let S be the sample space. So, now

$$S = A + A' \quad (4)$$

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

1) From (2)

$$\Pr(A') = 1 - \Pr(A) \quad (6)$$

$$= 1 - 0.35 \quad (7)$$

$$= 0.65 \quad (8)$$

2) From (3)

$$\Pr(B') = 1 - \Pr(B) \quad (9)$$

$$= 1 - 0.45 \quad (10)$$

$$= 0.55 \quad (11)$$

3) From (1),(2) and (3).

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \quad (12)$$

$$= 0.35 + 0.45 - 0 \quad (13)$$

$$= 0.80 \quad (14)$$

4) From (1)

$$\Pr(AB) = 0 \quad (15)$$

5) For $\Pr(AB')$ consider $\Pr(A)$. So, from (5).

$$\Pr(A) = \Pr(A.S) \quad (16)$$

$$= \Pr(A.(B + B')) \quad (17)$$

$$= \Pr(AB + AB') \quad (18)$$

$$= \Pr(AB) + \Pr(AB') - \Pr(AB.AB') \quad (19)$$

$$= \Pr(AB) + \Pr(AB') - \Pr(AA.(BB')) \quad (20)$$

$$= \Pr(AB) + \Pr(AB') - \Pr(AA.(BB')) \quad (21)$$

$$= \Pr(AB) + \Pr(AB') \quad (22)$$

BB' is empty set. So, $\Pr(A(BB')) = 0$. From (1) and (3).

$$\Pr(AB') = \Pr(A) - \Pr(AB) \quad (23)$$

$$= 0.35 - 0 \quad (24)$$

$$= 0.35 \quad (25)$$

6) Using Demorgan's laws that is $(A + B)' = A'B'$. From (14).

$$\Pr(A'B') = \Pr((A + B)') \quad (26)$$

$$= 1 - \Pr(A + B) \quad (27)$$

$$= 1 - 0.80 \quad (28)$$

$$= 0.20$$