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EE24BTECH11051 - Prajwal

1) The probability that a student will pass in the final examination in both english and hindi is 0.5 and the probability passing neither is 0.1.If the probability of passing the english examination is 0.75,what is probability of passing the hindi examination
Solution:-

Event	Denotation
A	Student do pass in English
A'	Student does not pass in English
B	Student do pass in Hindi
B'	Student does not pass in English

TABLE 1: defining events

Below are some postulates and theorems from boolean algebra :

	(a)	(b)
Postulate 2	$A + 0 = A$	$A \cdot 1 = A$
Postulate 5	$A + A' = 1$	$A \cdot A' = 0$
Theorem 1	$A + A = A$	$A \cdot A = A$
Theorem 2	$A + 1 = 1$	$A \cdot 0 = 0$
Theorem 3, involution	$(A')' = A$	-
Postulate 3, commutative	$A + B = B + A$	$AB = BA$
Theorem 4, associative	$A + (B + C) = (A + B) + C$	$A(BC) = (AB)C$
Postulate 4, distributive	$A(B + C) = AB + AC$	$A + BC = (A + B)(A + C)$
Theorem 5, DeMorgan	$(A + B)' = A'B'$	$(AB)' = A' + B'$
Theorem 6, absorption	$A + AB = A$	$A(A + B) = A$

TABLE 1: defining events

Non-Negativity Axiom:

$$P(A) \geq 0$$

The probability of any event A is always non-negative.
Normalization Axiom:

$$P(S) = 1$$

The probability of the sample space S (i.e., the set of all possible outcomes) is 1.
Additivity Axiom (Countable Additivity for Disjoint Events): If $A_1, A_2, A_3, \ldots$ are

mutually exclusive (disjoint) events, then:

$$P(A_1 \cup A_2 \cup A_3 \cup \dots) = P(A_1) + P(A_2) + P(A_3) + \dots$$

For any two event A and B,

$$\because A + A' = 1 \tag{1.1}$$
$$AB + A'B = B \tag{1.2}$$
$$\implies \Pr(AB) + \Pr(A'B) = \Pr(B) \tag{1.3}$$
$$\because B + B' = 1 \tag{1.4}$$
$$AB + AB' = A \tag{1.5}$$
$$\implies \Pr(AB) + \Pr(AB') = \Pr(A) \tag{1.6}$$
adding (1.2) and (1.5) (1.7)
$$A + B = AB + AB + AB' + A'B \tag{1.8}$$
$$A + B = AB + AB' + A'B \tag{1.9}$$
$$\Pr(A + B) = \Pr(AB) + \Pr(AB') + \Pr(A'B) \tag{1.10}$$
Adding (1.3),(1.6) and (1.10) and cancelling same terms (1.11)
$$\Pr(AB) = \Pr(A) + \Pr(B) - \Pr(A + B) \tag{1.12}$$
$$\because \Pr(A'B') = \Pr((A + B)') \tag{1.13}$$
$$\Pr(A'B') = 1 - \Pr(A + B) \tag{1.14}$$

From the given data in question,

$$\Pr(A) = 0.75 \tag{1.15}$$
$$\Pr(AB) = 0.5 \tag{1.16}$$
$$\Pr((A + B)') = 0.1 \tag{1.17}$$

Now using axioms of probability (boolean logic), Thus, we write

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{1.18}$$
$$= 0.75 + \Pr(B) - 0.5 \tag{1.19}$$
$$= 0.25 + \Pr(B) \tag{1.20}$$
$$\Pr((A + B)')) = 1 - \Pr(A + B) \tag{1.21}$$
$$0.1 = 1 - 0.25 - \Pr(B) \tag{1.22}$$
$$\Pr(B) = 0.65 \tag{1.23}$$