EE23010 Assignment

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Question 12.13.3.11
Prove that

(i) $\Pr(A) = \Pr(AB) + \Pr(AB')$
(ii) $\Pr(A+B) = \Pr(AB) + \Pr(AB') + \Pr(A'B)$

Solution:

(i) consider RHS:

$$A = A(B+B') \tag{1}$$
$$\Pr(A) = \Pr(A(B+B')) \tag{2}$$
$$= \Pr(AB+AB') \tag{3}$$
$$= \Pr(AB) + \Pr(AB') - \Pr((AB)(AB')) \tag{4}$$
$$= \Pr(AB) + \Pr(AB') - \Pr(ABB') \tag{5}$$
$$= \Pr(AB) + \Pr(AB') \tag{6}$$

(ii) consider RHS:

$$A+B = A(B+B') + B(A+A') \tag{7}$$
$$\Pr(A+B) = \Pr(A(B+B') + B(A+A')) \tag{8}$$
$$= \Pr(AB + (AB' + BA')) \tag{9}$$
$$= \Pr(AB) + \Pr(AB' + BA') - \Pr(AB(AB' + BA')) \tag{10}$$
$$= \Pr(AB) + \Pr(AB') + \Pr(BA') + \Pr(AB'BA') \tag{11}$$
$$= \Pr(AB) + \Pr(AB') + \Pr(A'B) \tag{12}$$