Multiplicative Rule of Probability

$$P(A \cap B) = P(A)P(B|A) = P(B)P(A|B)$$

Independent Events

Two events A and B are said to be independent if

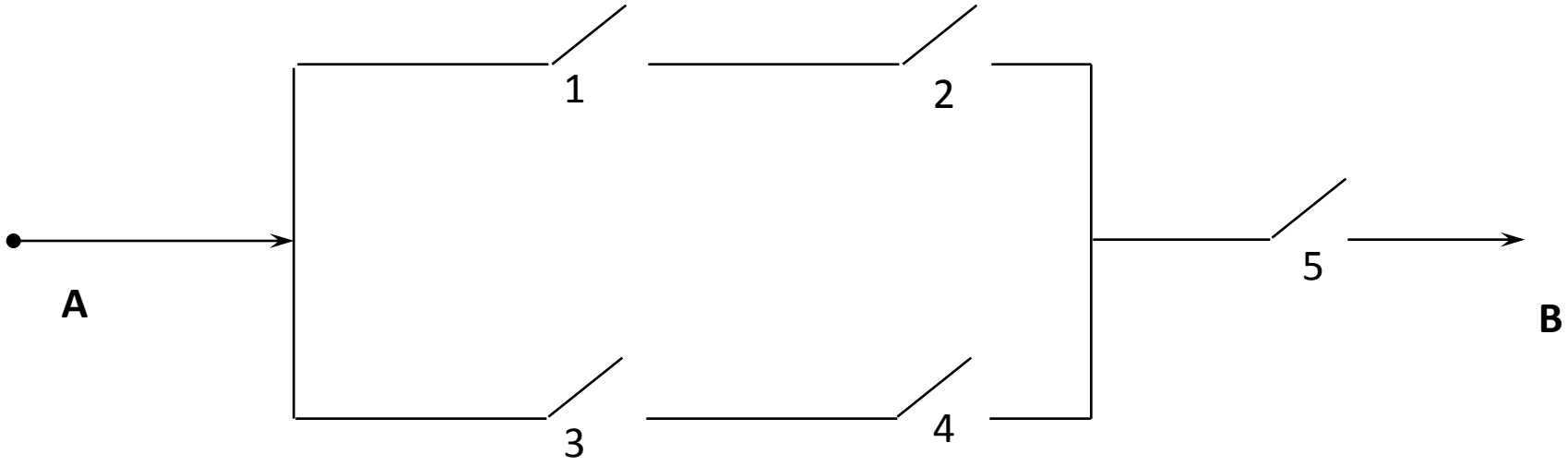
$$P(A|B) = P(A)$$

If two events A and B are independent then

$$P(A \cap B) = P(A)P(B)$$

Law of Total Probability

$$P(A) = P(A|B)P(B) + P(A|B^c)P(B^c)$$

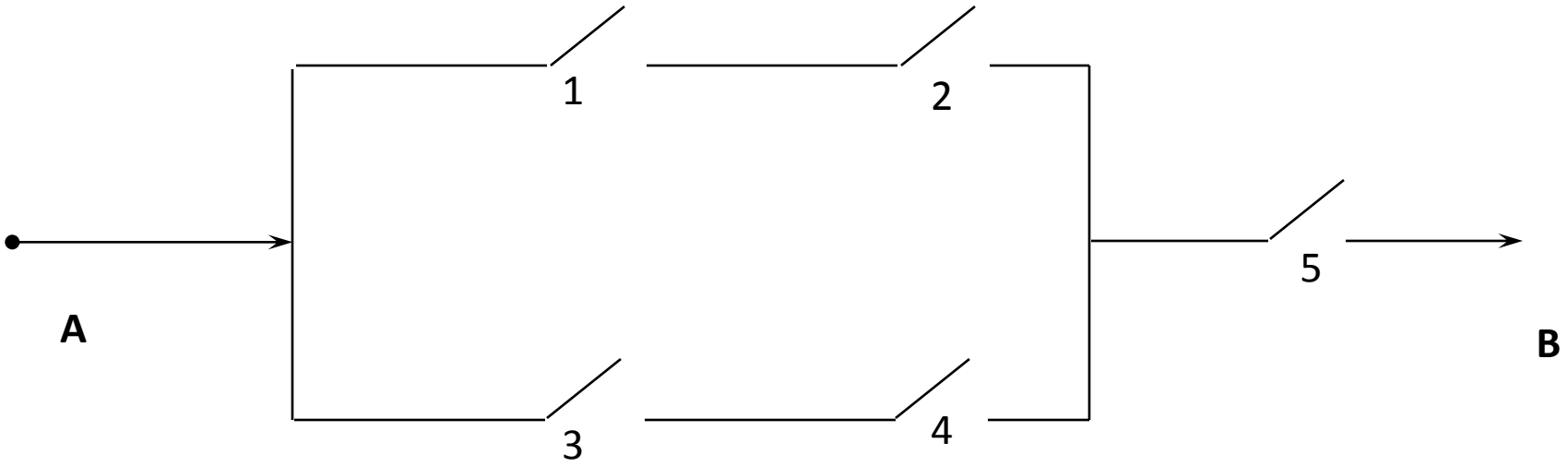


P(upper branch works) = P(C1 **and** C2)

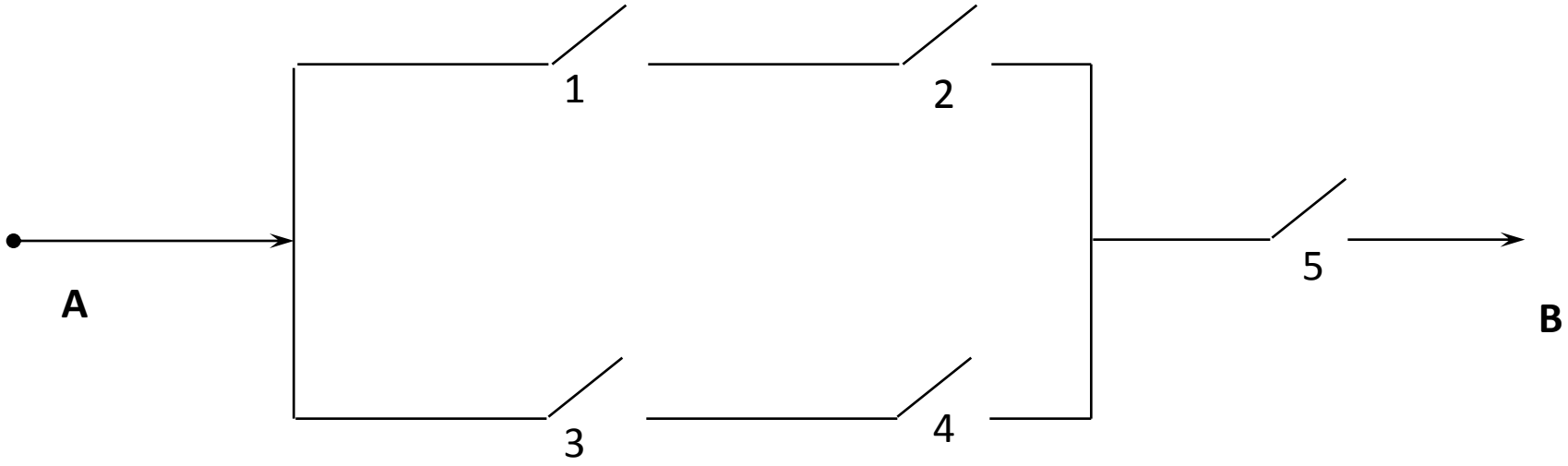
Electrical Circuit 1

The probabilities of closing the ith relay in the circuit shown below are

Circuit	1	2	3	4	5
P(closure)	.70	.60	.65	.65	.97



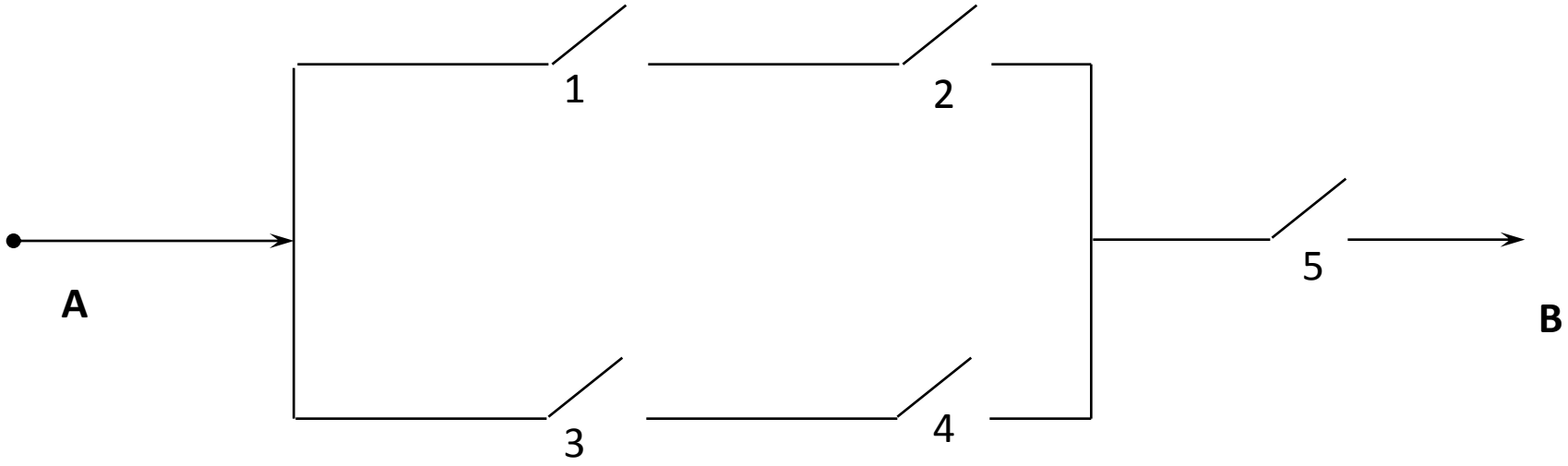
If all relays function independently, what is the probability that a current flows between A and B?



P(upper branch works) = P(C1 **and** C2)

= P(C1 ∩ C2)

= P(C1)P(C2)



P(upper branch works) = P(C1 **and** C2)

= P(C1 ∩ C2)

= P(C1)P(C2)

= (.70)(.60) = 0.42

P(lower branch works) = (0.65)(0.65) = 0.4225

P(upper branch **or** lower branch **or both** works) =

$P(B1 \cup B2) = P(B1) + P(B2) - P(B1 \cap B2)$

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$= 0.42 + 0.4225 - (0.42)(0.4225)$

$= 0.66505$

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$P(B1 \cup B2) = P(B1) + P(B2) - P(B1 \cap B2)$

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$= 0.66505$

This is the probability that part 1 of our circuit works!!

$P(\text{Whole Circuit Works}) = P(C5 \cap (B1 \cup B2))$

$= (0.97)(0.66505)$

$= 0.645$