

Exercise 1.

Using the truth table, prove the following equalities.

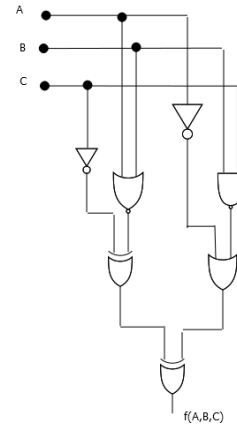
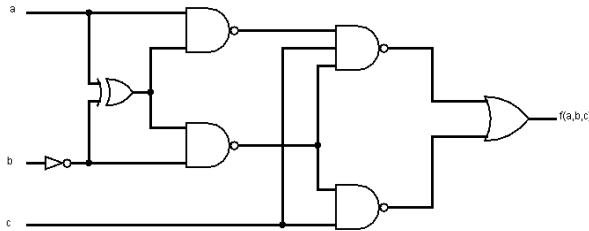
$$a.(\bar{a} + b) = a.b, \quad a \oplus b = \bar{a}.b + a.\bar{b}, \quad \overline{a \oplus b} = a.b + \bar{a}.\bar{b}.$$

Exercise 2.

1. *How would you hardware-implement a four-input OR gates using only two-input OR gates ?*
2. *How would you hardware-implement a four-input AND gates using only two-input AND gates ?*
3. *How dou you implement three-input EX-OR logic functions with the help of two-input EX-OR gates ?*

Exercise 3.

Give output-logical function expressions.

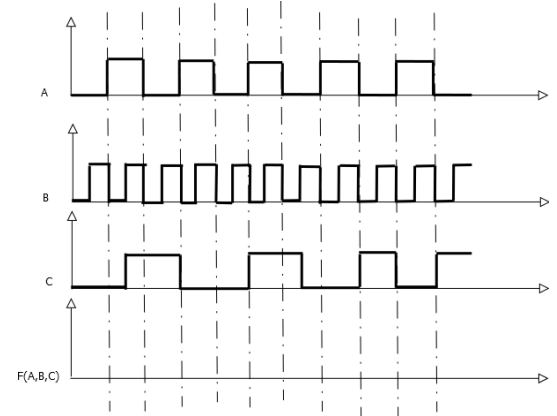


Exercise 4.

Let us define a circuit by the following logical function

$$F(A, B, C) = \overline{(A \oplus B)}.C.$$

1. Give the graphic representation of the circuit.
2. Describe the output waveform for the input signals given in the figure bellow.



Exercise 5.

Let us define a circuit by the truth table bellow.

1. Give the logical expression of the output Y .
2. Draw the chronogram of the circuit.

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Exercise 6.

1. Find the dual of $a.b.c.\bar{d} + a.\bar{b}.\bar{c}.d + \bar{a}.\bar{b}.\bar{c}.\bar{d}$.
2. Find the complement of $a + [(b + \bar{c}).d + \bar{e}].f$.

Exercise 7. Simplify the following Boolean expressions.

1. $S = a.b.c + a.b.\bar{c} + a.b.\bar{c} + a.\bar{b}.c + a.\bar{b}.\bar{c} + \bar{a}.b.c + \bar{a}.b.\bar{c} + \bar{a}.\bar{b}.\bar{c} + \bar{a}.\bar{b}.c$.
2. $S = (\bar{a} + b + \bar{c}).(\bar{a} + b + c).(c + d).(c + d + e)$.