EE5811 : FPGA LAB
ASSIGNMENT 1

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February 05, 2022

Question 1a) State the law represented by the following proposition and prove it with the help of a truth table:

P $\lor P = P$

Solution:
This is the Idempotent law which states that:

$$X + X = X$$

$$X \cdot X = X$$

In Boolean algebra, we know that:
$0 + 0 = 0$
$0 \cdot 0 = 0$
$1 + 1 = 1$
$1 \cdot 1 = 1$

Let us consider the OR logic:

x	y	x+y
0	0	0
0	1	1
1	0	1
1	1	1

Let us consider the AND logic:

x	y	x.y
0	0	0
0	1	0
1	0	0
1	1	1

We observe that when both the inputs are same, the output is same as the input.This proves the Idempotent law

Question 1b) State the Principle of Duality

Solution:
Duality principle states that when both the sides of a Boolean algebraic equation are replaced by their duals, the Boolean identity remains valid.
i.e. Every Boolean expression remains valid if the operators and identity elements are interchanged as follows:
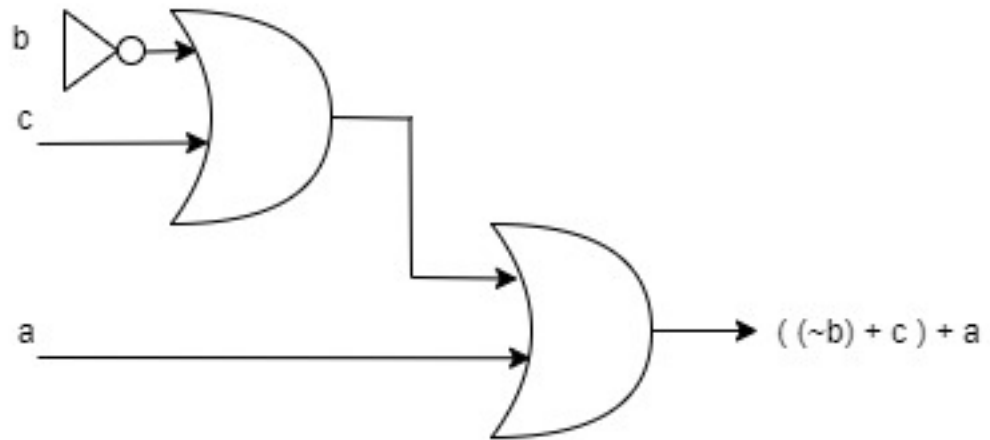
$$+ \leftrightarrow .$$
$$1 \leftrightarrow 0$$

Question 1c) Find the complement of the following Boolean expression using De-Morgan's law: $F(a,b,c) = ((\neg b + c) + a)$

Solution :
$$\neg((\neg b + c) + a) = \neg(\neg b + c) + \neg a$$
$$= ((\neg(\neg b)).(\neg c)).(\neg a)$$
$$= b.(\neg c).(\neg a)$$

((~b) + c) + a

b ⊳o→
c →

((~b) + c) + a

a →

Complement of : ((~b) + c) + a

a ⊳o→
c ⊳o→

b →

((b) . (~c) . (~a))

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