UNIVERSIDAD AUTÓNOMA DE QUERÉTARO
FACULTAD DE INGENIERÍA

ALGEBRA BOOLEANA

2° PRACTICA

Integrants:

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Subject: Sistemas digitales de lógica reconfigurable I

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I. Objective:

The objective of this practice is to learn and implement methods to derive and simplify Boolean functions from a truth table using maxterms and minterms. Through this practice, students will develop skills to derive Boolean functions and apply Boolean algebra properties to reduce them to their minimal expression, thereby enhancing their understanding and handling of fundamental concepts in digital logic.

Methodology:

1. Generate the truth table for each item
2. Establish the equations by minterms or maxterms according to their properties.
3. Program the obtained output functions and their input combinations.
4. Start the simulation.
5. Compare the results with the truth table.
6. Document the results.

II. Development and Results:

Function I

Truth table:

A	B	C	S1
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Simplification:

A’B’C’ + A’BC’ + AB’C’ + ABC’ + ABC

A’C’ (B’ + B) + AC’(B’+B) +ABC

A’C’ + AC’ + ABC

C’(A’+A) +ABC

C’+ABC

Function 2

Truth table:

A	B	C	S2
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Simplification:

AB'C+ABC
AC(B'+B)
AC

Function 3

A	B	C	S3
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

Simplification:

AB'C+ABC'+ABC
A(B'C+BC'BC)
A(B'C+B(C'+C))
A(B'C+B)

a. Code

Next, I will provide the code with explanations for each part that composes it:

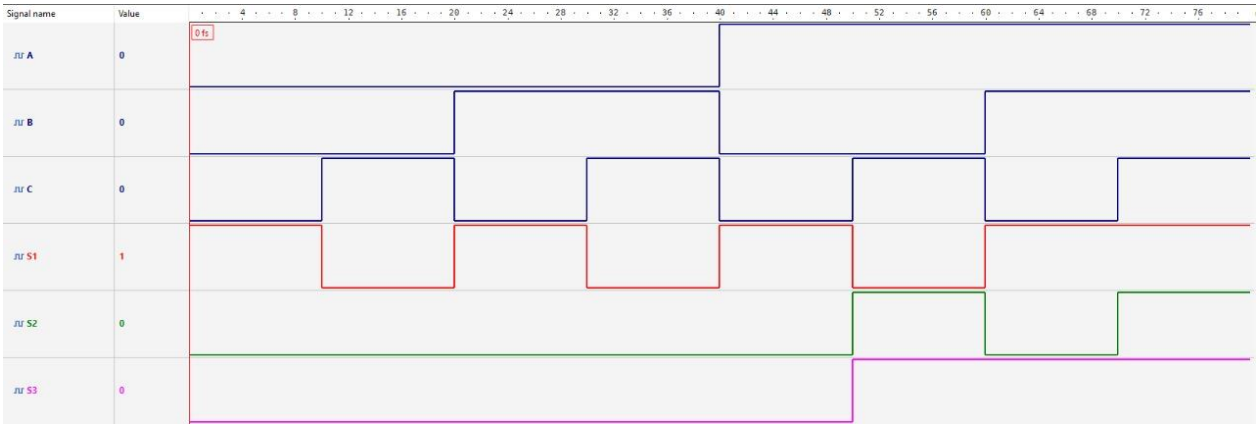
```
library IEEE;
use     IEEE.std_logic_1164.all;

-- Entidad donde declaramos entradas y salidas
entity P2 is
        port
        (
                A: in std_logic;
                B: in std_logic;
                C: in std_logic;
```

```
                S1: out std_logic;
                S2: out std_logic;
                S3: out std_logic
        );
end P2;

-- Arquitectura donde se hacen las operaciones o relaciones booleanas
Architecture PArch2 of P2 is
begin
        S1 <= not C or (A and B and C);        -- 1er ejercicio
        S2 <= A and C;                         -- 2do ejercicio
        S3 <= ((not B and C) or B) and A;      -- 3er ejercicio
end PArch2;
```

b. Simulation



III. Conclusion

In conclusion, this practice session effectively showcased the power of Boolean algebra in simplifying complex Boolean functions derived from truth tables using maxterms and minterms. Starting with the creation of a truth table, we identified the minterms to form an initial, often lengthy, Boolean equation. By leveraging the properties of Boolean algebra, we were able to significantly reduce this equation, minimizing the number of logic gates (OR, AND, NOT) required. This simplification not only maintained the original functionality but also optimized the circuit design.