PH3204: Electronics Laboratory

Experiment 04: Study of Boolean algebra truth tables for Logic Gate functions using AND, OR, NAND, NOR etc. ICs

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Contents

1 Theory

Boolean algebra delas with variables only two possible output,0 and 1 (false and true). A Boolean function takes in one or more boolean inputs and produces a bollean output. A boolean function can be implemented in the form of a boolean circuit using logic gates. Some of the most common logic gates along with their truth tables are given below:
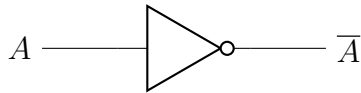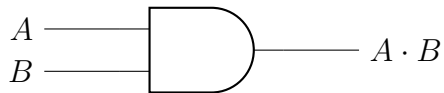
- **NOT Gate**

Figure 1: Symbol of NOT Gate

A	$\overline{A}$
0	1
1	0

Table 1: Truth Table for NOT Gate

- **AND Gate**

A	B	$A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

Table 2: Truth Table for AND Gate

- **OR Gate**
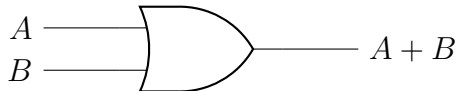
A	B	$A + B$
0	0	0
0	1	1
1	0	1
1	1	1

Table 3: Truth Table for OR Gate

- **NAND Gate**
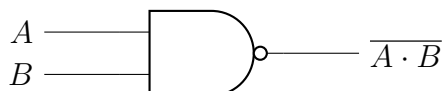
A	B	$\overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

Table 4: Truth Table for NAND Gate

- **NOR Gate**
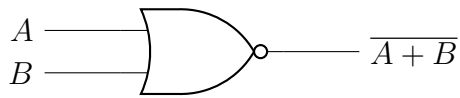
A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

Table 5: Truth Table for NOR Gate

- **XOR Gate**
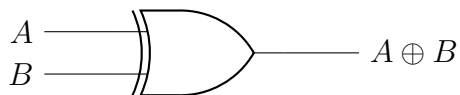
A	B	$\overline{A \oplus B}$
0	0	0
0	1	1
1	0	1
1	1	0

Table 6: Truth Table for XOR Gate

2 Boolean Circuit Verification

2.1 Example 1
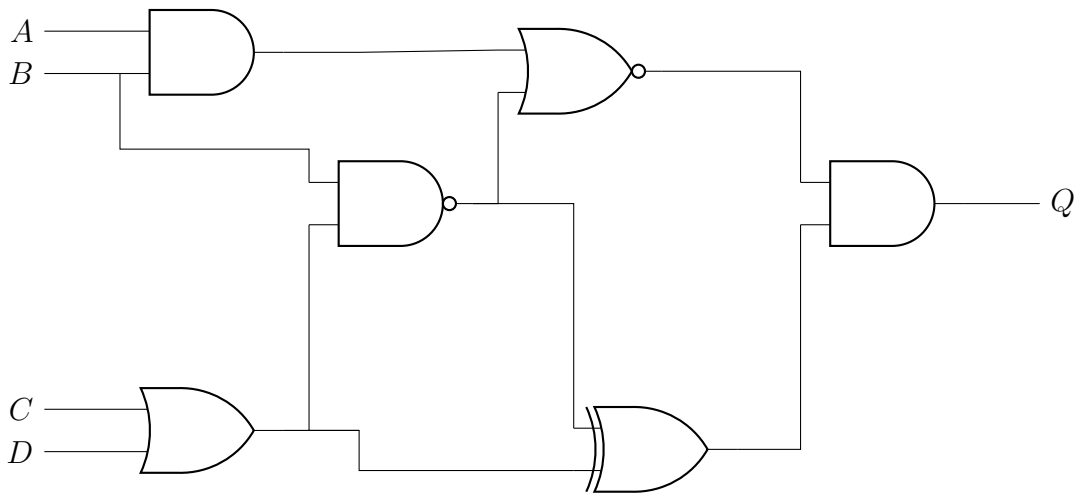
A	B	C	D	Q
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1

A	B	C	D	Q
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Table 7: Truth Table for Example 1

2.2 Example 2
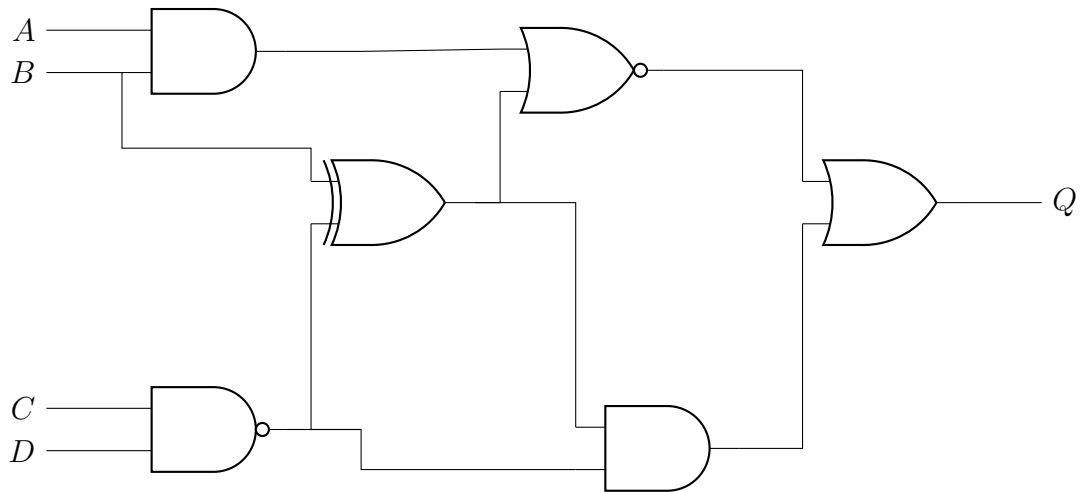
A	B	C	D	Q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Table 8: Truth Table for Example 2

2.3 Example 3
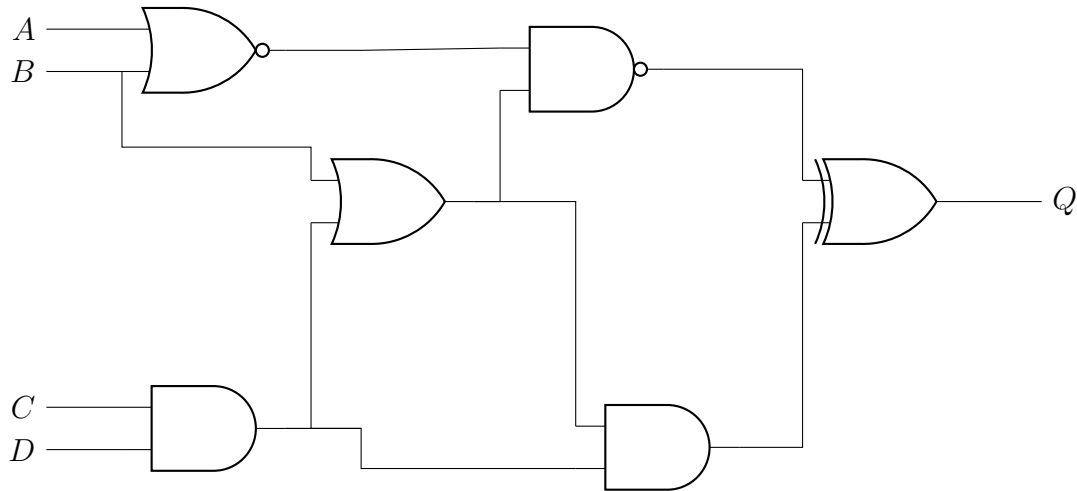
A	B	C	D	Q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Table 9: Truth Table for Example 3

3 Conclusion

In this experiment, we studied three different bollena circuits and verified the truth tables for each of the circuit. In each case , the truth tables were verified to be correct.

4 Sources of Error