LAB 1- LOGIC GATES

Group: 36

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Objectives

- Construct simple combinational logic circuits from a schematic.
- Experimentally determine the functional operation of simple combinational logic circuits.
- Identify equivalent logic gates to those produced by various circuit configurations
- from the resulting truth table.
- Connect various gates together to create simple logic functions.
- Analyse combinational logic circuits and predict their operation.
- Construct and test more complex combinational logic circuits.

Equipment & components

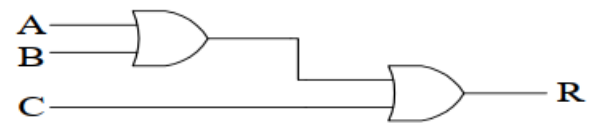
- Altera DE2 – 115 card
- Quatrus II 13.0 service – pack 1

Circuit Diagrams

Part I – Combinational Logic Circuits Construction

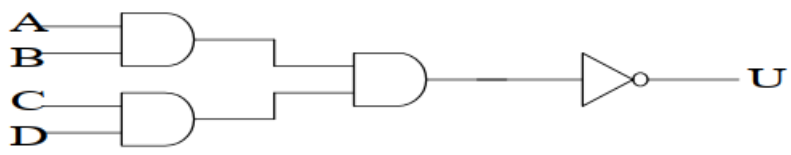
One-chip logic circuit

Figure 5.1.1: One-chip logic circuit



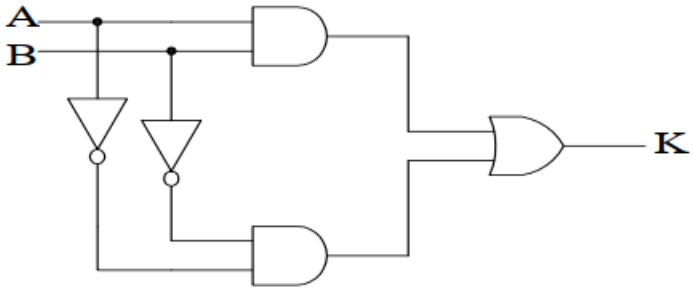
Two-chip logic circuit

Figure 5.1.2: Two-chip logic circuit



Three-chip logic circuit

Figure 5.1.3: Three-chip logic circuit



Part II - Combinational Logic Circuits Analysis

Exclusive Or Circuit

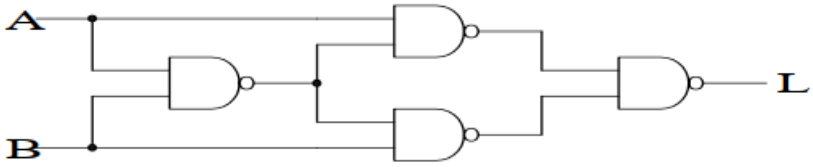


Figure 5.1.5: Exclusive OR circuit

And Circuit

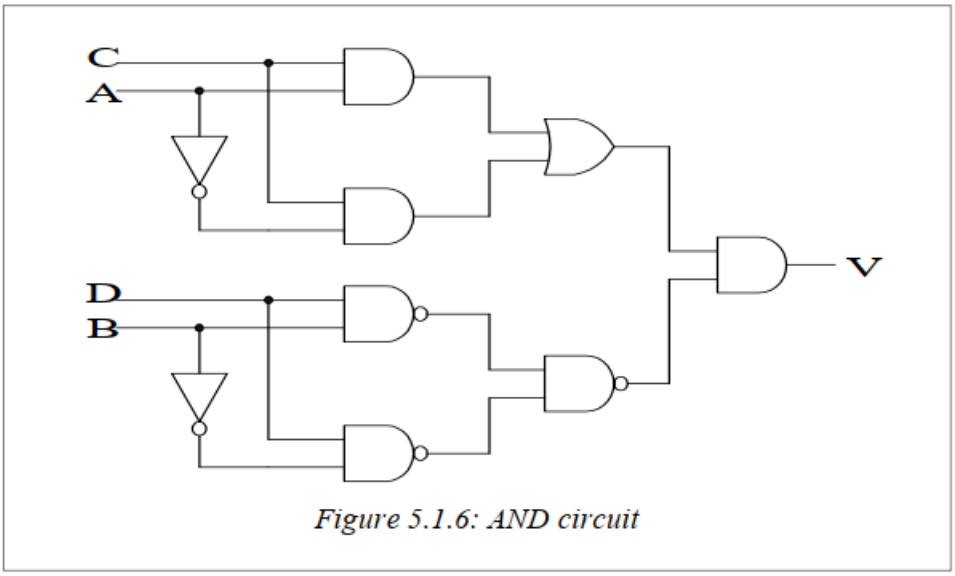


Figure 5.1.6: AND circuit

Or Circuit

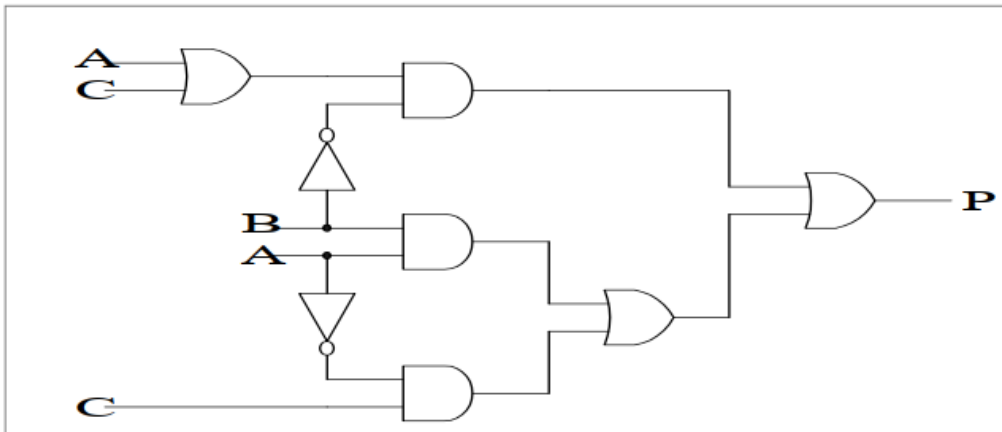


Figure 5.1.7: OR circuit

Multiple Output Circuit

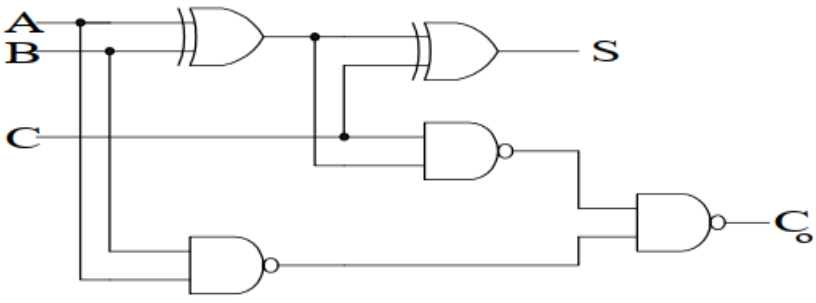
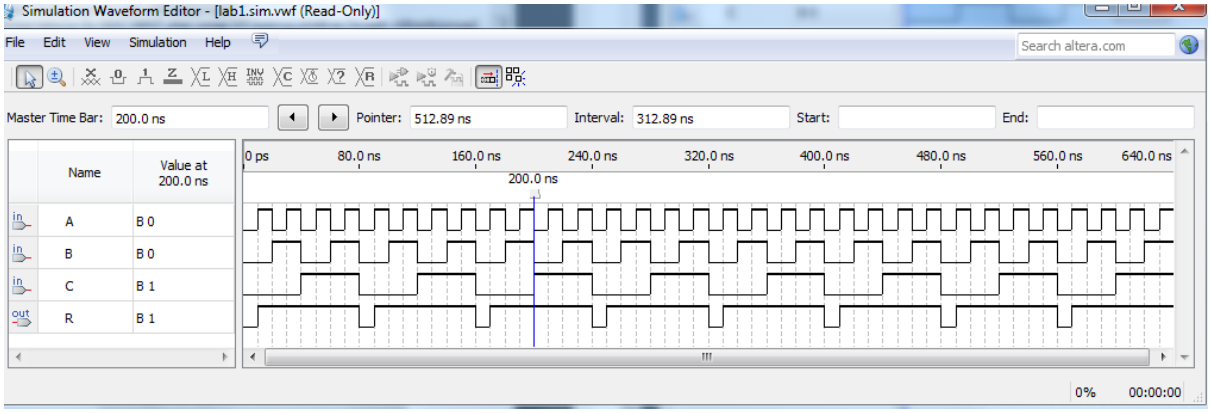


Figure 5.1.8: Multiple output circuit

Experimental Data and Data Processing

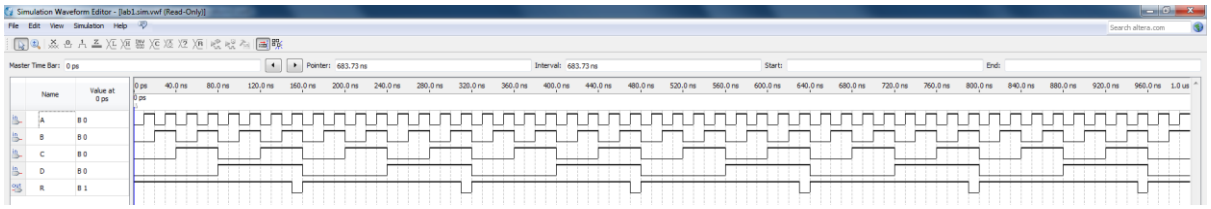
Part I – Combinational Logic Circuits Construction

One-chip logic circuit



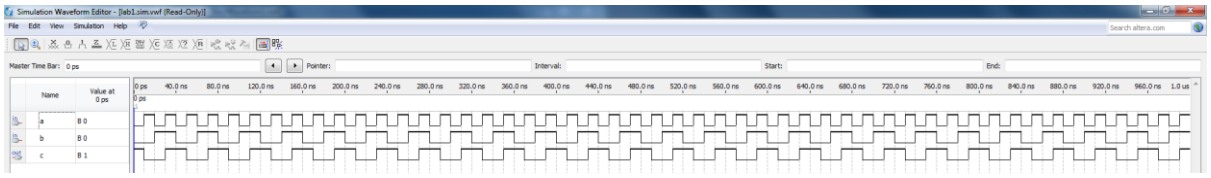
Input given from dip switches			Observed Output from LED's
A	B	C	R
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Two-chip logic circuit



Input given from dip switches			Observed Output from LED's	
A	B	C	D	R
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	1
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	1
1	1	1	0	1
1	1	1	1	0

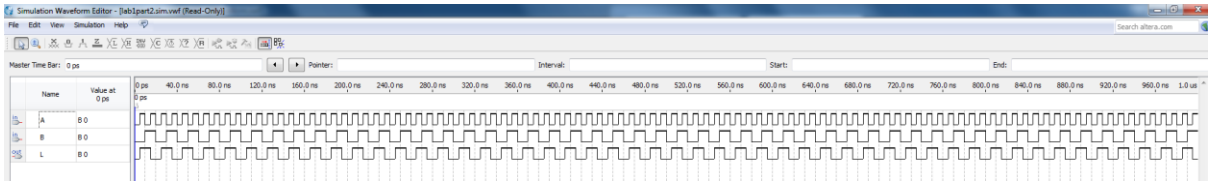
Three-chip logic circuit



Input given from dip switches		Observed Output from LED's
A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

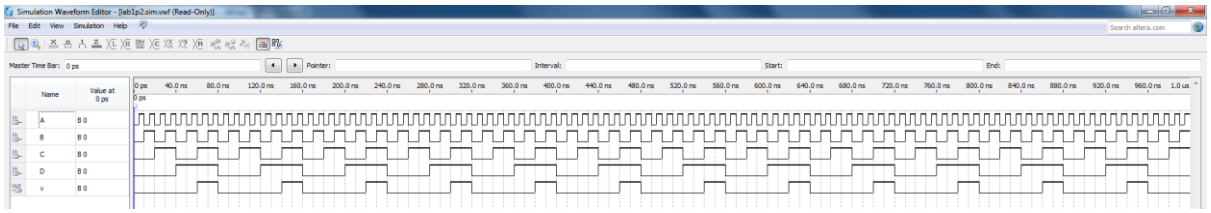
Part II - Combinational Logic Circuits Analysis

Exclusive Or Circuit



Input given from dip switches		Observed Output from LED's
A	B	L
0	0	0
0	1	1
1	0	1
1	1	0

And Circuit



Input given from dip switches			Observed Output from LED's	
A	B	C	D	V
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

Comparison of expected data and experimental data

Part I – Combinational Logic Circuits Construction

One-chip logic circuit

Excepted

Input given from dip switches			Observed Output from LED's
A	B	C	R
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Experimental data

Input given from dip switches			Observed Output from LED's
A	B	C	R
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

There was no difference on One-Chip logic circuit between Excepted and Experimental data

Two-chip logic circuit

Excepted

Input given from dip switches			Observed Output from LED's	
A	B	C	D	R
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	1
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	1
1	1	1	0	1
1	1	1	1	0

Experimental data

Input given from dip switches			Observed Output from LED's	
A	B	C	D	R
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	1
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	1
1	1	1	0	1
1	1	1	1	0

There was no difference on Two-Chip logic circuit between Excepted and Experimental data

Three-chip logic circuit

Excepted

Input given from dip switches		Observed Output from LED's
A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

Experimental data

Input given from dip switches		Observed Output from LED's
A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

There was no difference on Three-Chip logic circuit between Excepted and Experimental data

Part II - Combinational Logic Circuits Analysis

Exclusive Or Circuit

Excepted

Input given from dip switches		Observed Output from LED's
A	B	L
0	0	0
0	1	1
1	0	1
1	1	0

Experimental data

Input given from dip switches		Observed Output from LED's
A	B	L
0	0	0
0	1	1
1	0	1
1	1	0

There was no difference on Exclusive Or Circuit between Excepted and Experimental data

And Circuit

Excepted

Input given from dip switches			Observed Output from LED's	
A	B	C	D	V
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

Experimental data

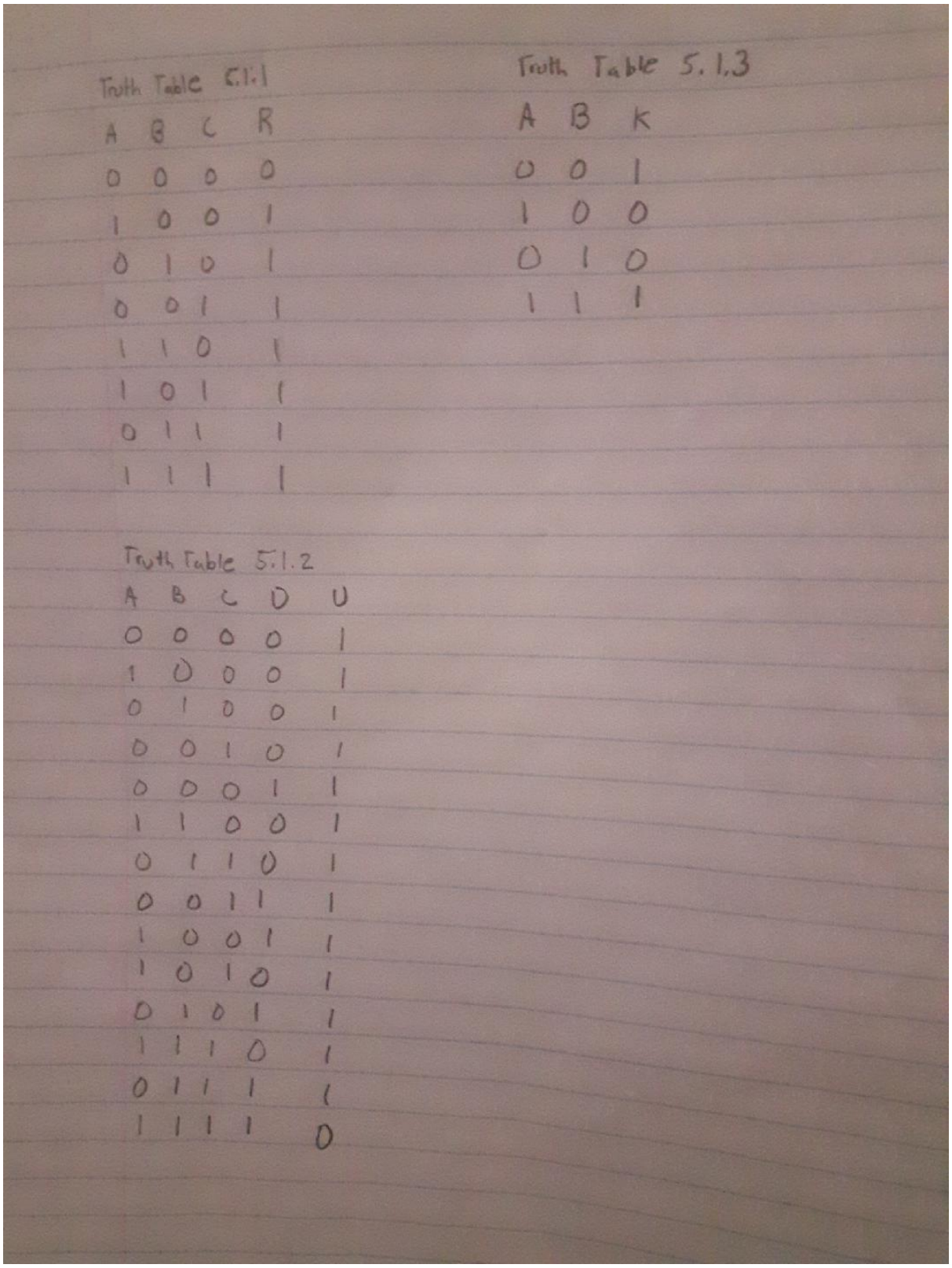
Input given from dip switches			Observed Output from LED's	
A	B	C	D	V
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

There was no difference on And Circuit between Excepted and Experimental data

Discussion and conclusion

On end result there was no difference between excepted and experimental data.

Laboratory data sheets



Truth Table 5.1.1

A	B	C	R
0	0	0	0
1	0	0	1
0	1	0	1
0	0	1	1
1	1	0	1
1	0	1	1
0	1	1	1
1	1	1	1

Truth Table 5.1.3

A	B	K
0	0	1
1	0	0
0	1	0
1	1	1

Truth Table 5.1.2

A	B	C	D	U
0	0	0	0	1
1	0	0	0	1
0	1	0	0	1
0	0	1	0	1
0	0	0	1	1
1	1	0	0	1
0	1	1	0	1
0	0	1	1	1
1	0	0	1	1
1	0	1	0	1
0	1	0	1	1
1	1	1	0	1
0	1	1	1	1
1	1	1	1	0

Part 2 Lab

Truth table 5.1.5

A	B	L
0	0	0
1	0	1
0	1	1
1	1	0

Truth Table 5.1.6

A	B	C	D	V
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1