1.1 Session 2: Exercises

Exercise1. Obtain in the truth table the result column of any of these functions:

f1 = A·B·C f2 = A+B+C

f3 = A·(B+ $\overline{C}$) f4 = $\overline{(A+B)\cdot(B+C)}$

f5 = $\overline{B}$ ·(A+C· $\overline{(A+B)}$) f6 = $\overline{(A+C)\cdot\overline{(B\cdot(C+B))}}$

f7 = (A+B)·($\overline{A}$ + $\overline{B}$) f8 = A+B·(A+C·B(A+B))

A B C	f1	f2	f3	f4	f5	f6	f7	f8
0 0 0								
0 0 1								
0 1 0								
0 1 1								
1 0 0								
1 0 1								
1 1 0								
1 1 1								

Exercise 2. Show the main theorems used in the perfect induction method. This is, complete the corresponding columns in the truth table and make sure that they are identical.

Single Variable Theorem

	Identity element				Complement element				Idempotence property				Null Element			
X	**0+X**	**X**	**1·X**	**X**	**X+ $\overline{X}$**	**1**	**X· $\overline{X}$**	**0**	**X+X**	**X**	**X·X**	**X**	**X+1**	**1**	**X·0**	**0**
0																
1																

Two variables Theorem

	Absorption Theorem				**DeMorgan Theorem**			
X Y	**X+X·Y**	**X**	**X·(X+Y)**	**X**	$\overline{X+Y}$	$(\overline{X} \cdot \overline{Y})$	$\overline{X \cdot Y}$	$(\overline{X} + \overline{Y})$
0 0								
0 1								
1 0								
1 1								

Three variables Theorem

	Distributive Property			
X Y Z	**X·(Y+Z)**	**X·Y+X·Z**	**X+(Y·Z)**	**(X+Y)·(X+Z)**
0 0 0				
0 0 1				
0 1 0				
0 1 1				
1 0 0				
1 0 1				
1 1 0				
1 1 1				

Extended Demorgan Theorem

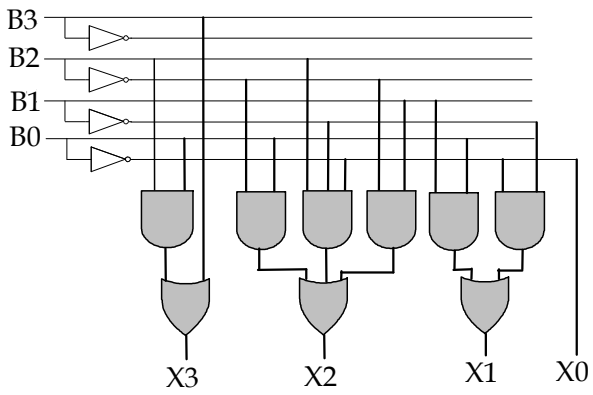
	Extended Demorgan Theorem			
X Y Z	$\overline{(X+Y+Z)}$	$\overline{X}\ \overline{Y}\ \overline{Z}$	$\overline{(XYZ)}$	$\overline{X}+\overline{Y}+\overline{Z}$
0 0 0				
0 0 1				
0 1 0				
0 1 1				
1 0 0				
1 0 1				
1 1 0				
1 1 1				

Exercise 3. Write beside each equality True (T) or False (F).

	$x+1 = x\cdot 1$
	$\overline{(x+y)} = \overline{x} + \overline{y}$
	$\overline{(x\cdot y)} = \overline{x} \cdot \overline{y}$
	$\overline{(x\cdot \overline{(y\cdot z)})} = \overline{(\overline{(x\cdot y)}\cdot z)}$
	$\overline{(x+\overline{(y+z)})} = \overline{(\overline{(x+y)}+z)}$

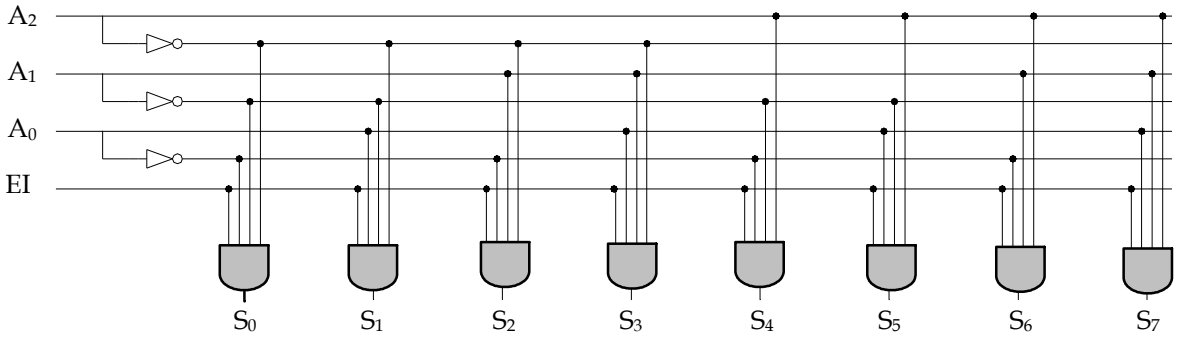
	$x+\overline{x} = x+1$
	$x+x = x\cdot x$
	$x+(x\cdot y) = x\cdot(x+y)$
	$0+x = 1\cdot x$
	$x\cdot\overline{x} = x\cdot 0$

Exercise 4. Analyse the following circuit obtaining its truth table.



B3	B2	B1	B0	X3	X2	X1	X0
0	0	0	0				
0	0	0	1				
0	0	1	0				
0	0	1	1				
0	1	0	0				
0	1	0	1				
0	1	1	0				
0	1	1	1				
1	0	0	0				
1	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				

Exercise 5. Analyse the following circuit obtaining its truth table.



EI	A2	A1	A0	S7	S6	S5	S4	S3	S2	S1	S0
0	0	0	0								
0	0	0	1								
0	0	1	0								
0	0	1	1								
0	1	0	0								
0	1	0	1								
0	1	1	0								
0	1	1	1								
1	0	0	0								
1	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								