

Homework 2

ELEN 21/COEN 21

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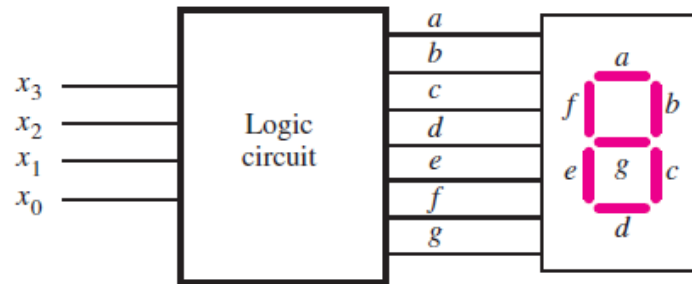
Lecture 3

1. (a) Write the unsimplified Boolean expression for the truth table.
 (b) Draw a 4-Variable Karnaugh map.
 (c) Write the simplified Boolean expression based on the Karnaugh map.

Truth Table

Inputs				Output
A	B	C	D	Y
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

2. Using the truth table of the 7 segment display provide a set of solutions for a, b, c, d, e, f, g (Lecture 3 - slides 14-15)



(a) Logic circuit and 7-segment display

	x_3	x_2	x_1	x_0	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1

(b) Truth table

3. Deliver minimal SoP and PoS expressions for the following K-map

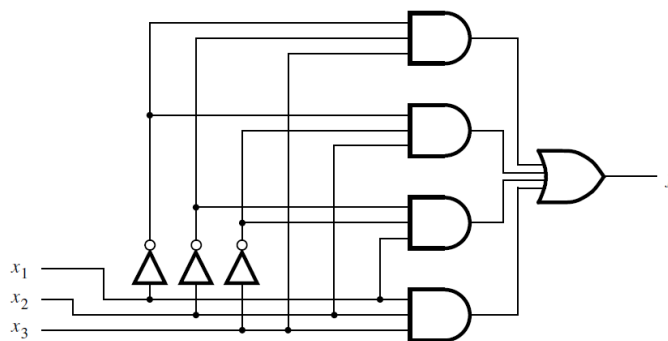
CD \ AB

1	1	1	1
1	0	0	1
1	0	0	0
1	1	0	0

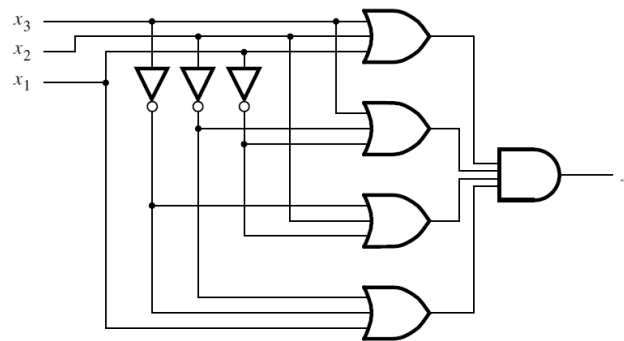
4. Implement the Boolean function $Z = \sum m(1, 3, 4, 5, 7)$ using 4:1 multiplexer.

Lecture 4

5. Write Verilog code to implement the function $f(x_1, x_2, x_3) = \sum m(1, 2, 3, 4, 5, 6)$ using structural code. Ensure that the resulting circuit is as simple as possible.
6. Write Verilog code to implement the function $f(x_1, x_2, x_3) = \sum m(0, 1, 3, 4, 5, 6)$ using behavioral code. Ensure that the resulting circuit is as simple as possible.
7. Write Verilog code (structural code) to implement the circuit a.
8. Write Verilog code (structural code) to implement the circuit b.



(a) Sum-of-products realization



(b) Product-of-sums realization