Name: Dmitry Landy

HOMEWORK #2 – Week 2

This homework is worth 10% of your course grade.

Read each problem carefully. Failure to follow the instructions for a problem will result in a zero score for that problem.

Submit the completed Homework via Assignment in LEO.

1. Construct a truth table for the Boolean equation:

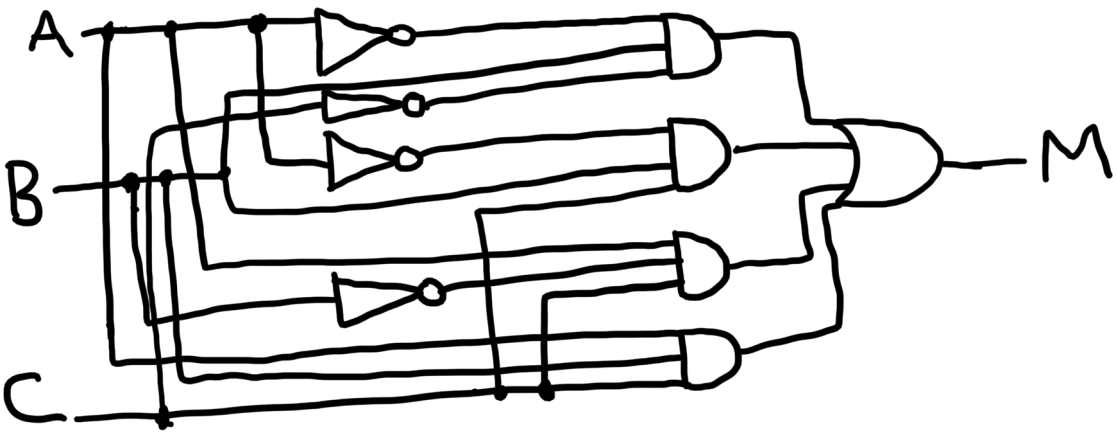
M = A'B C' + A'B C + A B'C + A B C

A	B	C	M
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

0'0 0' + 0'0 0 + 0 0'0 + 0 0 0 = 101+100+010+000= 0+0+0+0 = 0
0'0 1' + 0'0 1 + 0 0'1 + 0 0 1 = 100+101+011+001= 0+0+0+0 = 0
0'1 0' + 0'1 0 + 0 1'0 + 0 1 0 = 111+110+000+010= 1+0+0+0 = 1
0'1 1' + 0'1 1 + 0 1'1 + 0 1 1 = 110+111+001+011= 0+1+0+0 = 1
1'0 0' + 1'0 0 + 1 0'0 + 1 0 0 = 001+000+110+100= 0+0+0+0 = 0
1'0 1' + 1'0 1 + 1 0'1 + 1 0 1 = 000+001+111+101= 0+0+1+0 = 1
1'1 0' + 1'1 0 + 1 1'0 + 1 1 0 = 011+010+100+110= 0+0+0+0 = 0
1'1 1' + 1'1 1 + 1 1'1 + 1 1 1 = 010+011+101+111= 0+0+0+1 = 1

2. Draw a simple **NOT, AND, OR** circuit in sum of products (SOP) form that represents the equation above.

M = A'B C' + A'B C + A B'C + A B C



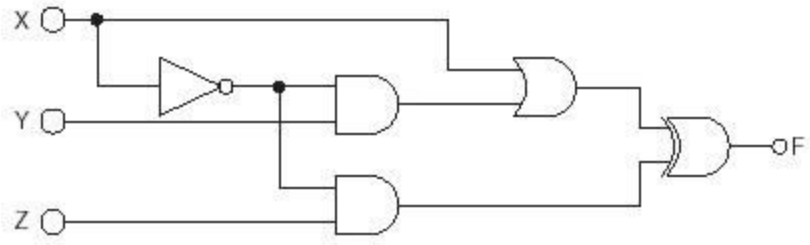
3. The truth table for a Boolean expression is shown below. Write the Boolean expression on SOP form

x	y	z	F
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

F= XYZ + XY'Z + XY'Z'+ X'YZ+ X'Y'Z'

000 + 010 + 011+100+111 = 1
001 + 011 + 001+ 101+ 110 = 0
010 + 000+ 001 + 110+ 101 = 0
011 + 001 + 000+111+100 = 1
100 + 110+ 111 + 000 + 011 = 1
101 + 111+ 110 + 001 + 010 = 1
110 + 100 + 101 + 010 + 001 = 0
111 + 101 + 100+ 011+ 000 = 1

4. Find the truth table that describes the following circuit:



F= (X OR (X' AND Y)) XOR (X AND Z)
F = X + (X'Y) ⊕ (XZ)

X	Y	Z	F
0	0	0	0
0	0	1	0
0	1	0	1

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

0 + (0’0) ⊕ (00) = 0 + 10 ⊕ 0 = 0 + 0 ⊕ 0 = 0
0 + (0’0) ⊕ (01) = 0 + 10 ⊕ 0 = 0 + 0 ⊕ 0 = 0
0 + (0’1) ⊕ (00) = 0 + 11 ⊕ 0 = 0 + 1 ⊕ 0 = 1
0 + (0’1) ⊕ (01) = 0 + 11 ⊕ 0 = 0 + 1 ⊕ 0 = 1
1 + (1’0) ⊕ (10) = 1 + 00 ⊕ 0 = 0 + 0 ⊕ 0 = 0
1 + (1’0) ⊕ (11) = 1 + 00 ⊕ 1 = 0 + 0 ⊕ 1 = 1
1 + (1’1) ⊕ (10) = 1 + 01 ⊕ 0 = 0 + 0 ⊕ 0 = 0
1 + (1’1) ⊕ (11) = 1 + 01 ⊕ 1 = 0 + 0 ⊕ 1 = 1

5.

Describe the function of a decoder circuit;

A decoder circuit functions by having multiple inputs and 2^n possible outputs, although there can only be one output (UMUC, 2018).

Identify the types and quantity of gates needed to implement a 3-to-8 decoder;

A 3-8 line decoder circuit has 3 NOT gates and 8 AND gates.

Either create (or give the location in the text) of a logic diagram of a decoder circuit

An example of a 3-8 decoder circuit can be seen in UMUC’s “Commentary on Circuits” Figure 2.7 (UMUC, 2018).

References

UMUC. (2018). CMIS 310 Computer Systems and Architecture. Retrieved from Week2/Digital Logic/Commentary On Circuits: https://learn.umgc.edu/d2l/le/content/485843/viewContent/18295979/View