Individual Homework 1 -- EECS 270, Spring '23 – Answers

1.

(!A*C)+(A*!B*!C)+(B*C).

А	В	С	!A*C	A*!B*!C	B*C	output
0	0	0				0
0	0	1	1			1
0	1	0				0
0	1	1	1		1	1
1	0	0		1		1
1	0	1				0
1	1	0				0
1	1	1			1	1

2. F=!a*b+!a*b+a*c*!d+!b

a) a, b, c, d, (F could be listed here...)

b) !a, a, b, !b, c, !d, (F could be listed here...)

c) !a*b, !a*b, a*c*!d, !b. (Yes, !b is a "product term", see page 55)

3. Just find the 1s. (!a*!b*c) + (a*b*!c) + (a*b*c)

4. $(!a^*!c^+b)^*c^+!(a^*b) = !(a^*b)$

The level of detail needed can be tricky, but as a rule, just use one rule at a time. There are multiple solutions.

(!a*!c + !b)*c + !(a*b)	Given
= !a*!c*c + !b*c + !(a*b)	Distributive
= !a*0 + !b*c + !(a*b)	Complement
= 0 + !b*c + !(a*b)	Null elements
= !b*c + !(a*b)	Identity
= !b*c + !a + !b	DeMorgan's
= !a + !b + !b*c	Commutative
= !a + !b	Covering
= !(a*b)	DeMorgan's



6. F=a*b + c*d; G=!(!(!(a*b)*!(c*d))

a. By the rules of logic (This one can get nasty, but there is a short parth) F=!(!(a*b)*!(c*d)) DeMorgan's F=!(!(a*b)*!(c*d))*1 Identity Note that G=!F So not equal

b.

а	b	С	d	F	!(a*b)	!(c*d)	!(!(a*b)*(c*d))	G
0	0	0	0		1	1	0	1
0	0	0	1		1	1	0	1
0	0	1	0		1	1	0	1
0	0	1	1	1	1	0	1	0
0	1	0	0		1	1	0	1
0	1	0	1		1	1	0	1
0	1	1	0		1	1	0	1
0	1	1	1	1	1	0	1	0
1	0	0	0		1	1	0	1
1	0	0	1		1	1	0	1
1	0	1	0		1	1	0	1
1	0	1	1	1	1	0	1	0
1	1	0	0	1	0	1	1	0
1	1	0	1	1	0	1	1	0
1	1	1	0	1	0	1	1	0
1	1	1	1	1	0	0	1	0

Again, we see F and G are actually inverses of each other.

- 7. It's a majority gate, which you've seen in lab. A=m0*m1+m1*m2+m2*m0 is the formula. You'd need to draw that as gates too.
- 8. T=!N4
- 9. 10101 & 01100 = 00100

10. .

- a. C₁₆
- b. 12₁₆
- c. A₁₆
- d. 25₁₆
- e. $571_8 = 101\ 111\ 001_2 = 1\ 0111\ 1001_2 = 179_{16}$
- 11. Combinational logic's output depends only on the current inputs. Sequential logic has memory and so depends on prior inputs also.