Homework 2 - Boolean Algebra - Gates / Error Detection

Due Monday Feb 10 - by end of class. You can turn in parts 3,4,5 on paper - 1 and 2 should be uploaded.

Remember that I have a grader and if you do not put your name on the top of your homework - you will *NOT* get credit. That is bad after doing the work!

Points: 200

Testing you are expected to produce a unit test for each of the following. The test should print out "PASS" if it is successful and run at least 4 examples of good and bad values for each.

1. 50pts - Implement a Lhun Verifier. Do it in C or C++.

2. 50pts - Implement a Verhoeff verifier in C or C++ (Go steal the code in C - see link - and give credit, note the license - you want an original that is MIT or 3 clause BSD then copy like crazy). This is the JavaScript(node.js) and Go version that I have on github.com. Search google for "verhoeff algorithm". https://github.com/pschlump/verhoeff_algorithm

   Java script: https://github.com/yuyudhan/verhoeff.git Do not copy this - it is proprietary code - No LICENSE file at all.

   Other solutions: License CC Attribution: https://en.wikibooks.org/wiki/Algorithm_Implementation/Checksums/Verhoeff_Algorithm

3. 25pts - Provide the circuit diagram in mixed logic for

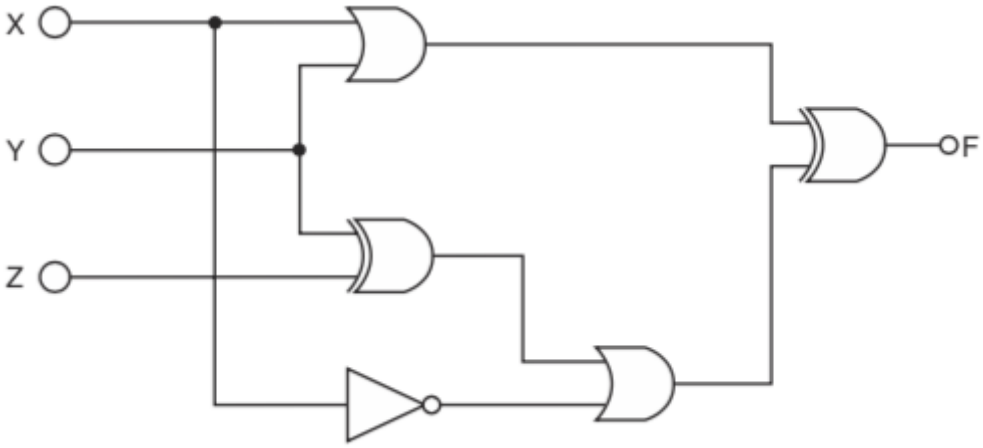
   Dec1 = (A & !B & !C & !D) & !X & Y

   Dec2 = (A & !B & !C & !D) & X & !Y

   Dec3 = (A & !B & !C & !D) & X & Y

   (A&!B&!C&!D) is a commmon sub-expression in the hardware.

4. 25pts - Derive the truth table for:


X
Y
Z
F

5. 50pts - Given the following truth table show the circuit for: (74ls47 7-segment LED decoder - see https://buzztech.in/bcd-to-seven-segment-decoder-program-in-vhdl/)

   I, J, K, L are inputs

   a, b, c, d, e, f, g are outputs

Decimal Digit	Hex	I	J	K	L		a	b	c	d	e	f	g	Display Pattern
0	0x0	0	0	0	0		1	1	1	1	1	1	0	
1	0x1	0	0	0	1		0	1	1	0	0	0	0	
2	0x2	0	0	1	0		1	1	0	1	1	0	1	
3	0x3	0	0	1	1		1	1	1	1	0	0	1	
4	0x4	0	1	0	0		0	1	1	0	0	1	1	
5	0x5	0	1	0	1		1	0	1	1	0	1	1	
6	0x6	0	1	1	0		1	0	1	1	1	1	1	
7	0x7	0	1	1	1		1	1	1	0	0	0	0	
8	0x8	1	0	0	0		1	1	1	1	1	1	1	
9	0x9	1	0	0	1		1	1	1	1	0	1	1	
10	0xA	1	0	1	0		1	0	0	1	1	1	1	
11	0xB	1	0	1	1		1	0	0	1	1	1	1	
12	0xC	1	1	0	0		1	0	0	1	1	1	1	
13	0xD	1	1	0	1		1	0	0	1	1	1	1	
14	0xE	1	1	1	0		1	0	0	1	1	1	1	
15	0xF	1	1	1	1		1	0	0	1	1	1	1	

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