

TSPE Practice Test: EE 2310, Digital Systems, Test #1

Name: _____ Student Number: _____

Put answers on the problem statement page, as for homework assignments. Staple work sheets in back if necessary.

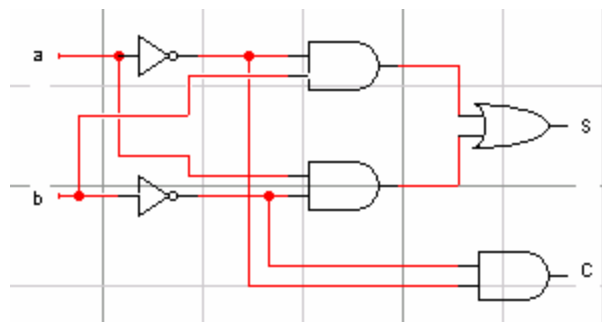
1. Find the Boolean expression in SOP form from the truth table. Draw the corresponding circuit. Then, draw a Karnaugh Map and simplify the Boolean Expression. Draw the new circuit, check for hazards, and redesign if necessary.

a	b	c	d	f
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

2. The Karnaugh map for a Boolean function is described by: $F = \sum m(8,9,12,13)$

Write the original expression. Use the Karnaugh map to simplify the expression. Write the simplified expression and draw the circuit.

3. The following half-adder was designed incorrectly. Fix it by redrawing the correct circuit.



4. Design a simple multiplexer that will output one of four data inputs D0, D1, D2, D3 depending upon a 2-bit address A1, A0 using NOT gates and three input AND gates.

Use the following output table:

A1	A0	Output
0	0	D0
0	1	D1
1	0	D2
1	1	D3

5. Construct a four bit adder/subtractor that performs twos complement addition or subtraction of positive numbers. Assume that A is always larger than B. The circuit should perform $A+B$ for $op=0$ and $A-B$ for $op=1$. Indicate when an overflow has occurred by setting an output OVFL to one. Use full adder modules. (You don't have to show the inner circuitry)

6. Convert the following decimal numbers to signed binary (2's complement byte form):

-17

-100

21

7. Convert the following 2's complement binary numbers to decimal:

1101 0110

0100 1110

1100 1101

8. Convert the following positive binary numbers to hexadecimal:

0100 1011

1010 1010

1111 1110

9. Convert the following hexadecimal numbers to unsigned binary (byte form):

0x f3

0x 8a

0x ae

10. Convert the following positive binary numbers to decimals.

110.11011

101.00101

0001 1.101

11. Convert the following decimals to binary. (Use 2x the number of binary places after the binary point as there are decimal places after the decimal point if non-exact)

12.3

101.125

3.12

12. Simplify the following expression: $F = \overline{(\overline{a}b)} \bullet \overline{(\overline{a}b)}$

13. Simplify the following expression: $F = (ab\overline{c}\overline{d}) + (ab\overline{c}d) + (a\overline{b}\overline{c}\overline{d}) + (a\overline{b}\overline{c}d)$