CSCIU 210 – Computer Organization

Homework-3 Key, Weight: 40 points

Due on Wednesday, October 3, 2018 at the beginning of the lecture (Hard Copy)

Note: You need to include your calculation details to receive full credit!

Q1. [10 points] A car has a fuel-level detector that outputs the current fuel-level as a 3-bit binary number, with 000 meaning empty and 111 meaning full. Create a circuit that illuminates a "low fuel" indicator light (by setting an output L to 1) when the fuel level drops below level 3.

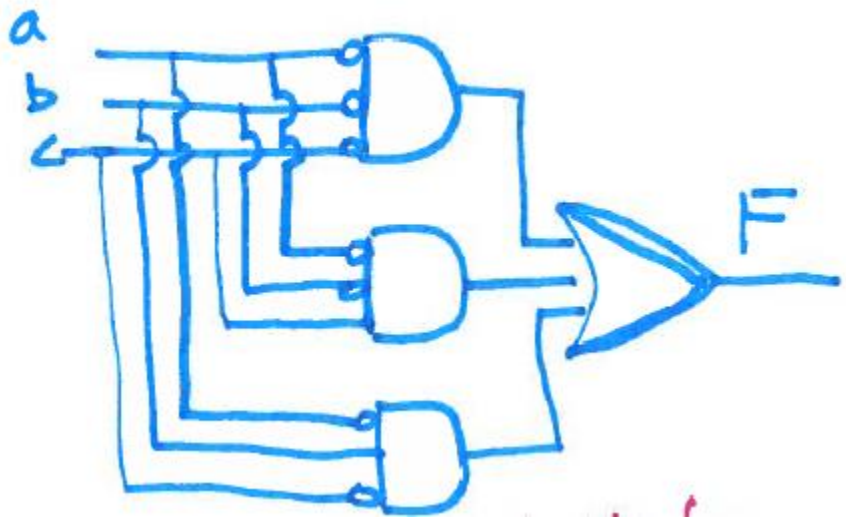
Solution:

The output is high ONLY when the fuel level drops BELOW 3.

a	b	c	Out (F)
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$$F = a'b'c' + a'b'c + a'bc'$$

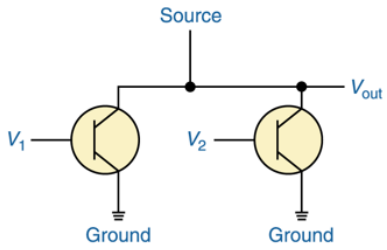
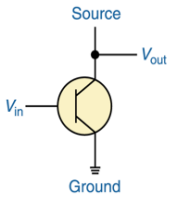
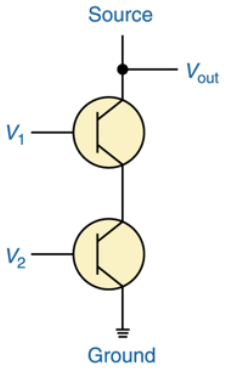
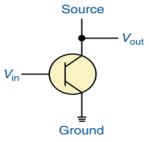
Logic Circuit Implementation:



You can simplify the equation to reduce the logic circuit complexity.

Q2. [10 points] Draw the transistor circuit for OR and AND gate.

Solution:

OR Gate (NOR and NOT)		AND Gate (NAND and NOT)	
			

Q3. [5 x 4=20 points] (For the following problems, finish your calculation in binary number. All of numbers are 8-bit **signed** integer. Use 2's complement method to perform subtraction. Your answer must be an 8-bit signed integer)

a. $11000111_2 + 01001011_2$

ANS: 00010010. No overflow happens

b. $11000111_2 + 10011001_2$

ANS: 01100000. Overflow happens

c. $0011011_2 - 11000011_2$

ANS: 01110100. No overflow happens

d. $10001000_2 - 10000000_2$

ANS: 00001000. No overflow happens