

CSC 137 Section 02 MIDTERM 1 Solutions

1) The binary numbers below are in signed 2's compliment representation.

$$10111 + 10110$$

a) Perform the given binary operation. (1 point)

b) Is there an overflow condition, and explain why or why not? (2 points)

a)

$$\begin{array}{r} 10111 \\ + 10110 \\ \hline 1\ 01101 \end{array}$$

b) Yes, there is an overflow condition because adding two negative numbers resulted in a positive number.

2) a) Generate the truth table for the following function: (2 points)

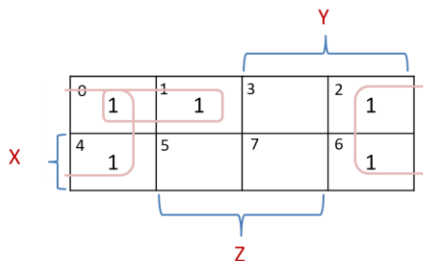
$$F = X'Z' + X'Y'Z + XZ'$$

X	Y	Z	F	m
0	0	0	1	m ₀
0	0	1	1	m ₁
0	1	0	1	m ₂
0	1	1	0	m ₃
1	0	0	1	m ₄
1	0	1	0	m ₅
1	1	0	1	m ₆
1	1	1	0	m ₇

b) Write the Boolean equation of this function in canonical sum-of-products form. (3 points)

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

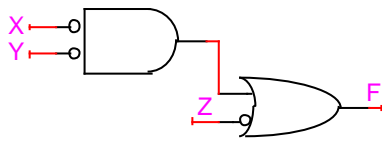
c) Use K-maps to find the simplest Boolean equation. (3 points)



$$F = Z' + X'Y'$$

Note: If your solution is not the simplest equation, but your solution is still correct, 1.5 points are awarded. If you have arrived at the simplest equation, but not through K-maps, 1.5 points are awarded.

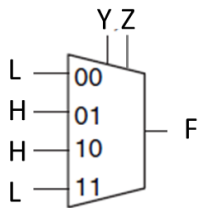
d) Draw the logic diagram of the simplified function using NOT, AND, OR gates. (2 points)



Note: If your Boolean equation in (c) is not the simplest, but your solution is still correct, 1.5 points are awarded.

3) Implement the following equation using a 4:1 multiplexer. (3 points)

$$F = YZ' + Y'Z$$



4) In the following diagrams, the signals are connected to a D-latch and a D-Flip Flop as shown. Draw the timing diagrams for the "Q for latch" and the "Q for Flip Flop" outputs. (4 points)

