10920EECS101001 Logic Design

Homework 1

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1. (10%)Represent –45 in both the 8-bit signed 1's complement representation, and the 8-bit signed 2's complement representation.
2. (10%)Draw logic diagrams to implement the following Boolean expressions:
   $F = [(u + x')(y' + z)]$
3. (20%) For the Boolean function F = xy'z + x'y'z + w'xy + wx'y + wxy
   a. Obtain the truth table of F.
   b. Draw the logic diagram, using the original Boolean expression.
   c. Use Boolean algebra to simplify the function to a minimum number of literals.
   d. Obtain the truth table of the function from the simplified expression and show that it is the same as the one in part a.
   e. Draw the logic diagram from the simplified expression, and compare the total number of gates with the diagram of part b.
4. (20%) Write the Boolean equations and draw the logic diagram of the circuit whose outputs are defined by the following truth table:

Table P2.27

f_1	f_2	a	b	c
1	1	0	0	0
0	1	0	0	1
1	0	0	1	0
1	1	0	1	1
1	0	1	0	0
0	1	1	0	1
1	0	1	1	1

5. (20%) Find the complement of the following expressions. Simplify it to a minimum number of literals:
   a. $(b + c')(a + c')(b' + c')$
   b. $w'x' + w(x + y + z)$
6. (20%) Convert each of the following expressions into sum of products and product of sums:
   a. $(w + xy')(x + y'z)$
   b. $xy + (w' + y'z')(z' + x'y')$