CS 215 Homework 3
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Problem 1A
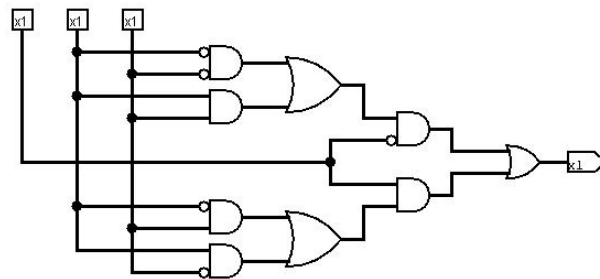
Representing the function F as POS and SOP:

$$POS = \bar{A}(\bar{B}\bar{C} + BC) + A(\bar{B}C + B\bar{C})$$
$$SOP = \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + AB\bar{C}$$
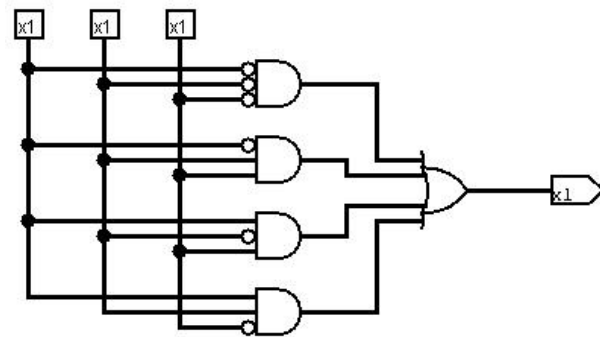
Problem 1B

Gate-level logic circuits for each of the representations.
    Product of Sums:

    Sum of Products:

Problem 1C

Truth table for the function's SOP and POS representations:

A	B	C	SOP	POS
0	0	0	1	1
0	0	1	0	0
0	1	0	0	0
0	1	1	1	1
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0

Problem 2 - Optimization of Circuit

This is the function form of the circuit:

$$F = \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}C$$

We'll use a Quine-McCluskey table to simplify the function:

Term	Matched?
$\bar{A}\bar{B}C$	Yes
$\bar{A}B\bar{C}$	Yes
$\bar{A}BC$	No
$A\bar{B}C$	No

Matched terms are like so:

$$\bar{A}\bar{B}C + \bar{A}BC = \bar{A}C$$
$$\bar{A}\bar{B}C + A\bar{B}C = \bar{B}C$$
$$\bar{A}B\bar{C} + \bar{A}BC = \bar{A}B$$

The table for this function then becomes:

	$\bar{A}\bar{B}C$	$\bar{A}B\bar{C}$	$\bar{A}BC$	$A\bar{B}C$
$\bar{A}C$	x		x	
$\bar{B}C$	x			x
$\bar{A}B$		x	x	

Therefore, the simplified function is $\bar{A}B + \bar{B}C$, which can be represented as a gate-level circuit as follows: