ECE 124: Homework 2
Spring 2023

Assigned: Thursday, March 9th
Due: Friday, March 24th

Show your work! (No credit even for correct answers without justification.)

Problems from the textbook (Digital Design 6th Ed., M. Mano and M. Ciletti)

2.3 **Simplify the following Boolean expressions to a minimum number of literals (each for 3 points)**

(a) xyz + x'y + xyz'
(b) x'yz + xz
(c) (x + y)'(x' + y')
(d) xy + x(wz + wz')
(e) (yz' + x'w)(xy' + zw')
(f) (x' + z')(x + y' + z')

2.4 **Reduce the following Boolean expressions to the indicated number of literals.**

(a) x'z' + xyz + xz' --- to three literals **(3 points)**
(b) (x'y' + z)' + z + xy + wz --- to three literals **(4 points)**
(c) w'x(z' + y'z) + x(w + w'yz) --- to one literal **(4 points)**
(d) (w' + y)(w' + y')(w + x + y'z) --- to four literals **(4 points)**
(e) wxy'z + w'xz + wxyz --- to two literals **(4 points)**

2.7 **Draw logic diagrams of the circuits that implement the original and simplified expressions in Problems 2.4 (c), (d), and (e).**

(c) logic circuit diagrams of the original expression **(3 points)** and simplified expression **(3 points)**
(d) logic circuit diagrams of the original expression **(3 points)** and simplified expression **(3 points)**
(e) logic circuit diagrams of the original expression **(3 points)** and simplified expression **(3 points)**

2.14 **Implement the Boolean function F = xy + x'y' + y'z (each for 5 points)**

(a) With AND, OR, and inverter gates.
(c) With AND and inverter gates.
(e) With NOR and inverter gates.

2.17 **Obtain the truth table for the following functions, and express each function in sum-of-minterms and product-of-maxterms form: (each for 5 points)**

(b) (cd + b'c + bd')(b + d)
(d) bd' + acd' + ab'c + a'c'

2.20 **Express the complement of the following functions in sum-of-minterms form: (each for 5 points)**

(b) F (x, y, z) = ∏ (3, 5, 7)

2.21 **Convert each of the following to the other canonical form: (each for 5 points)**

(a) F (x, y, z) = ∑ (1, 3, 5)

2.22 **Convert each of the following expressions into sum of products and product of sums: (each for 5 points)**

(a) (u + xw)(x + u'v)

(b) x' + x(x + y')(y + z')