EECS1010 Logic Design Spring 2023

Homework 3

Due: **1:20pm on April 11th, 2023** (before the class starts). No late homework.
For each question, please write down the thinking/calculation process. No credit will be given if only answer without process is provided.

1. Use K-map to simplify the following Boolean expressions. (20%, each 5%)

   (a) $F(x, y, z) = \Sigma(0, 1, 4, 5)$

   (b) $F(w, x, y, z) = \Sigma(11, 12, 13, 14, 15)$

   (c) $F(A, B, C, D, E) = \Sigma(0, 2, 4, 6, 9, 13, 21, 23, 25, 29, 31)$

   (d) $F(A, B, C, D) = \Pi(0, 2, 3, 4, 6, 7, 8, 10, 11, 14)$

2. Find all the prime implicants and essential prime implicants of the Boolean expressions in Question 1. (16%, each 4%)
3. Simplify the following Boolean expressions to the form of product-of-sums. (10%, each 5%)

   (a) $F(x, y, z) = xz' + y'z' + yz' + xy'$

   (b) $F(w, x, y, z) = wy'z' + y'z + wx' + wx'yz$
4. Draw the NAND-NAND and NOR-NOR implementations of the Boolean functions in Question 3. (20%, each 10%)
5. Draw the AND-OR and OR-AND implementations of the Boolean functions in Question 3. (20%, each 10%)
6. Draw the OR-NAND implementation of the Boolean functions in Question 3. (14%)