**Logic Design Midterm (SW)**

**2022. 04. 11**

**Show your solving process, not just only answer.**

**10 points/problem if not specified**

1. Number conversion.

(a) 110101.1101012 to hexadecimal

(b) A79.F16 to octal

2. List the goals (reasons) of simplification at least five. (5 points)

3. Show the binary arithmetic operations with 5-bit hardware. (Note: We are human beings but it is the logic design exam)

(a) A = -9, B = +6, and A + B

(b) A = +13, B = -5, and A – B

4. Simplify the logic expressions: F(A, B, C, D) = AB’C’ + CD’ +BC’D’

(a) Using factoring and/or multiplying out

(b) Using k-map

5. Compare “four corners” in the K-map and the USA tour map. (5 points)

6. Find the optimal (THE BEST) SOP using k-map. (20 points)

F(w, x, y, z) = Σ m(0, 2, 3, 4, 8, 11, 15) + Σ d(5, 10, 13)

7. Find the prime implicants & essential prime implicants & the minimum SOP. (20 points)

f(s, w, x, y, z) = Σ m(0, 4, 6, 13, 14) + Σ d(2, 9, 18)

8. Realize f(A, B, C, D) = AB + CD with NAND gates only.