Fall, 2025 Digital Circuit Design (英專班)

1. Represent -100_{10} to eight bits (a) signed-magnitude (b) signed-1's-complement (c) signed-2's-complement representation. (15%)

2. Consider the following Boolean function: $F = (xz' + x'z)yz + xy$. Draw the schematic of this function with logic gates. (15%)

3. Given the true table as shown below. Write down the Boolean function in (a) sum of minterms form and (b) product of maxterms form. (10%)

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

4. Simplify the Boolean function $F(w, x, y, z) = \Sigma(0, 1, 2, 5, 8, 9, 10)$ into (a) sum-of-products form and (b) product-of-sums form. (30%)

5. Find all the prime implicants of the Boolean function: $F(A, B, C, D) = \sum(0,2,3,5,7,8,9,10,11,13,15)$ (30%)