Homework #3

Due 23:59 on 11/2 (Tue)

1. (16%) Write the truth table for a 4-bit Gray code converted from a 4-bit binary code, and give the logic circuit that implement the functions.
2. (16%) Given that $xy = 0$ and $x + y = 1$, prove using (a) algebraic manipulation and (b) truth table that $xz + x'y + yz = y + z$.
3. Consider the Boolean functions f and g, as given in the following truth table.
   (a) (12%) List the minterms and maxterms of f, g, f', and g'.
   (b) (12%) Express f and g in sum-of-minterms (som) algebraic form, and then simplify them to reduced sop form.
   (c) (12%) Draw the logic diagrams for f and g from its reduced sop form, using only the NOT, AND, and OR gates.

a	b	c	f	g
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

4. (16%) Simplify $f(w, x, y, z) = \Sigma(4, 5, 7, 12, 14, 15) + \Sigma_d(3, 8, 10)$ using a K-map, and give its logic diagram using only 2-input NAND gates and NOT gates (inverters).
5. (16%) Simplify $f(a, b, c, d, e) = \Sigma(6, 9, 13, 18, 19, 25, 27, 29)$ using any method. What are the PIs, EPIs, and minimal covers? Implement it with a 2-level NOR-NOR circuit.

