Homework for Chapter 6: Digital Logic Circuits

1. Convert to binary, and to decimal:

   (a) 757.25_{10} (b) 10111011.1_2

2. Add, subtract, and multiply in binary:

   (a) 1111 and 1001 (b) 1010101 and 111011

3. Give the circuit symbol and truth table for an AND gate, an OR gate, an inverter, a NAND gate, a NOR gate, and an XOR gate. Assume two inputs for each gate (except the inverter).

4. Prove the following theorems algebraically:

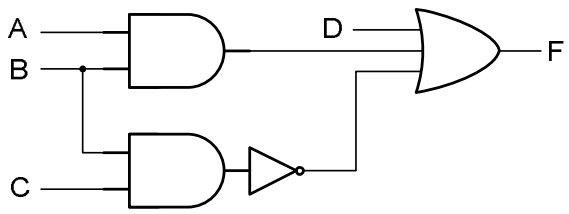
   (a) $X \cdot (\overline{X} + Y) = X \cdot Y$ (b) $X \cdot Y + X \cdot \overline{Y} = X$

   (c) $(A + B) \cdot (A + \overline{B}) = A$

5. Illustrate the circuit diagrams for both sides of the following theorem; then, make the truth tables. And verify the theorem.

$$(X + \overline{Y}) \cdot Y = X \cdot Y$$

6. Write a Boolean expression for the output of the logic circuit illustrated bellow. (This is Problem 6.6 (c) in the textbook.)



7. By using DeMorgan's theorem, verify the following equation:

$$\overline{(\overline{A} + B) \cdot \overline{C}} = A \cdot \overline{B} + C$$

8. Simplify the following expression with Karnaugh Map.

$$Z = A \cdot B \cdot \overline{C} \cdot \overline{D} + \overline{A} \cdot \overline{B} \cdot \overline{C} \cdot D + A \cdot \overline{B} \cdot \overline{C} \cdot D + \overline{A} \cdot \overline{B} \cdot C \cdot D + \overline{A} \cdot B \cdot C \cdot D + A \cdot B \cdot C \cdot D + \overline{A} \cdot \overline{B} \cdot C \cdot \overline{D} + \overline{A} \cdot B \cdot C \cdot \overline{D}$$