

數位邏輯設計 Ch3 HW

注意事項：請寫出詳細計算與分析過程，不可以只寫答案!

Problems:

- 3.5 a. Write the unsimplified Boolean equation for the logic diagram in Figure 3.101.
b. Redraw the logic diagram in Figure 3.101 so that it conforms to the bubble-to-bubble convention. Rewrite the Boolean expression of the redrawn circuit.

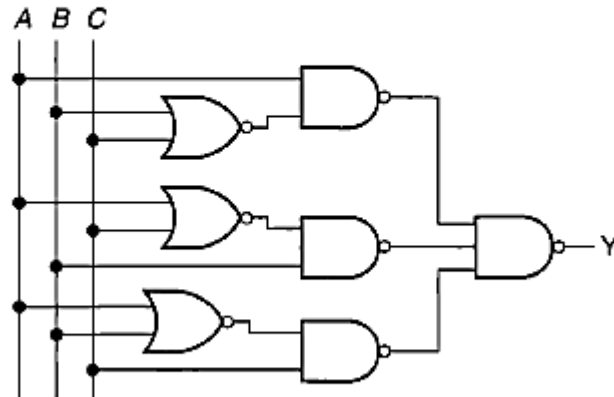


FIGURE 3.101 Problem 3.5: Logic Circuits

- 3.6 The circuit in Figure 3.102 is called a majority vote circuit. It will turn on an active-HIGH indicator lamp only if a majority of inputs (at least two out of three) are HIGH. Write the Boolean expression for the circuit.

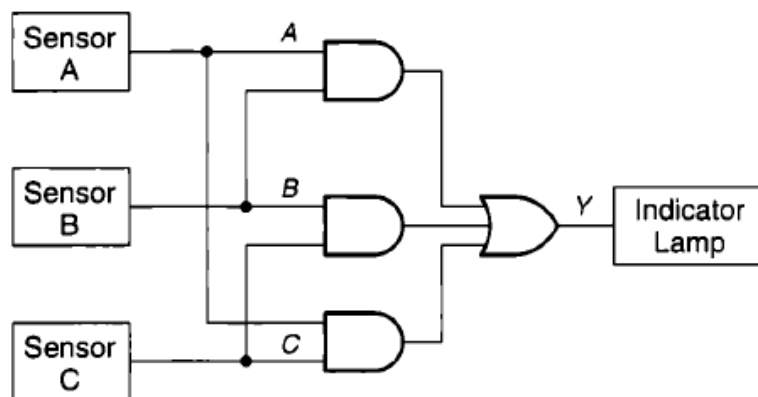


FIGURE 3.102 Problem 3.6: Majority Vote Circuit

- 3.15** Find the Boolean expression, in both sum-of-products (SOP) and product-of-sums (POS) forms, for the logic function represented by the following truth table. Draw the logic diagram for the POS form only.

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

- 3.19** Write the Boolean expression for the circuit shown in Figure 3.103. Use the distributive property to transform the circuit into a sum-of-products (SOP) circuit.

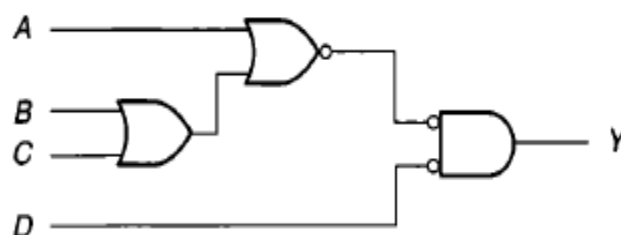


FIGURE 3.103 Problem 3.19: Logic Circuit

- 3.22** Use the rules of Boolean algebra to simplify the following expressions as much as possible.

c. $S = (\overline{T + U}) V + (T + U)$

e. $Y = (\overline{A} + B + \overline{D}) A C + \overline{A} \overline{B} \overline{D}$

f. $P = (\overline{Q} \overline{R} + S T)(\overline{Q} \overline{R} + Q)$

g. $U = (X + \overline{Y} + \overline{W} Z)(W Y + Y + \overline{W} Z)$

- 3.38** Use the Karnaugh map method to reduce the Boolean expression represented by the following truth table to simplest SOP form.

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

- 3.49** Excess-3 code is a decimal code that is generated by adding 0011 ($= 3_{10}$) to a BCD code. Table 3.25 shows the relationship between a decimal digital code, natural BCD code, and Excess-3 code. Draw the circuit of a BCD-to-Excess-3 code converter, using the Karnaugh map method to simplify all Boolean expressions.

TABLE 3.25 BCD and Excess-3 Code

Decimal Equivalent	BCD Code				Excess-3			
	D_4	D_3	D_2	D_1	E_4	E_3	E_2	E_1
0	0	0	0	0	0	0	1	1
1	0	0	0	1	0	1	0	0
2	0	0	1	0	0	1	0	1
3	0	0	1	1	0	1	1	0
4	0	1	0	0	0	1	1	1
5	0	1	0	1	1	0	0	0
6	0	1	1	0	1	0	0	1
7	0	1	1	1	1	0	1	0
8	1	0	0	0	1	0	1	1
9	1	0	0	1	1	1	0	0