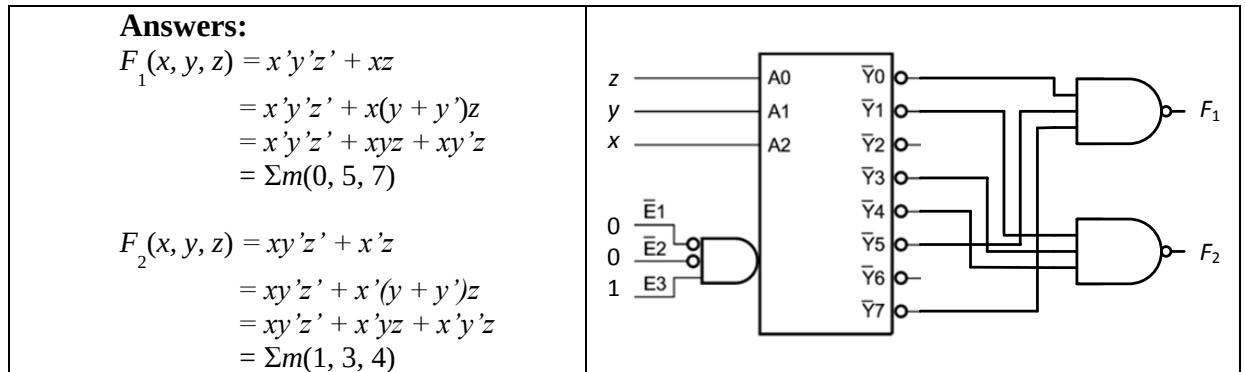


Logic Circuit Design - Tutorial 4

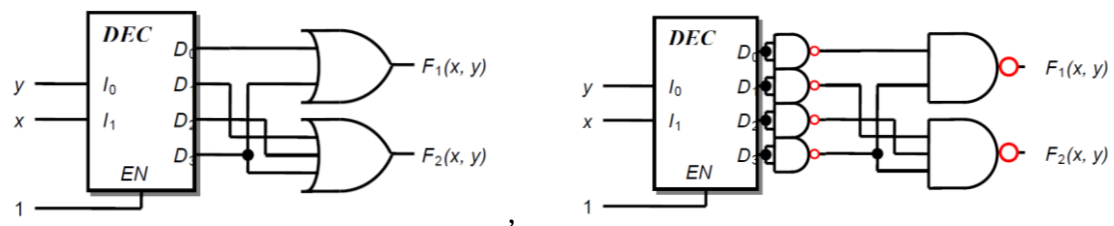
1. Use 74LS138 3-to-8 decoder.



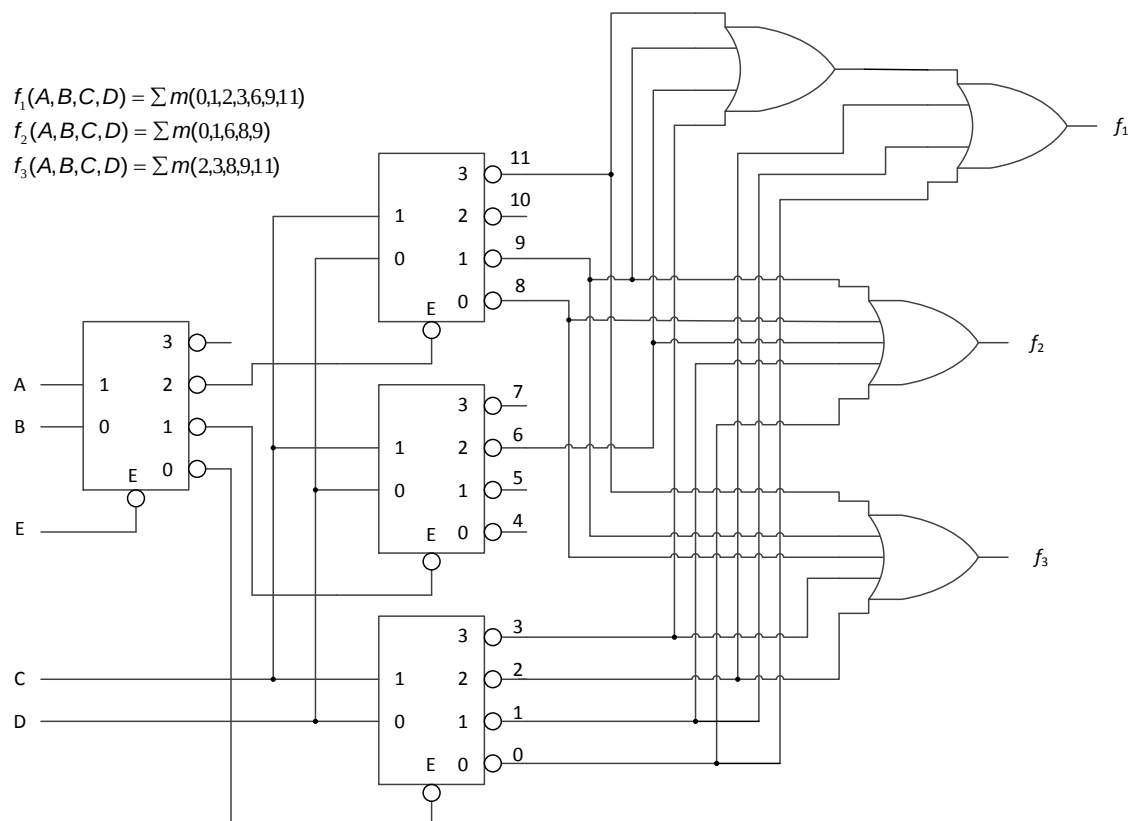
Use DeMorgan's law to realize the circuit with simple logic gates

Idea is: $F_1 = A + B + C \Rightarrow \bar{F}_1 = \overline{A + B + C} = \bar{A} \cdot \bar{B} \cdot \bar{C} \Rightarrow F_1 = \overline{\bar{A} \cdot \bar{B} \cdot \bar{C}}$

- 2.



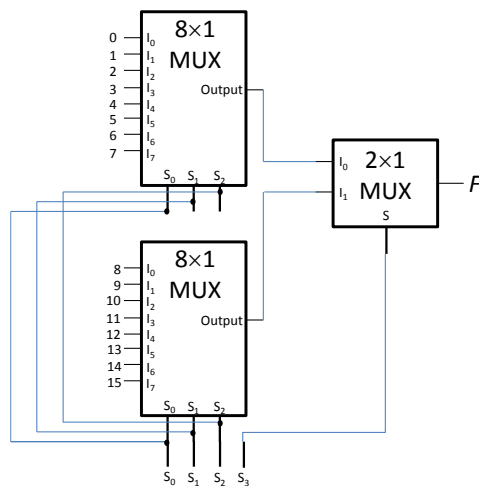
- 3.



4.

	x	y	c_i	Σ	c_o
0	0	0	0	0	0
1	0	0	1	1	0
2	0	1	0	1	0
3	0	1	1	0	1
4	1	0	0	1	0
5	1	0	1	0	1
6	1	1	0	0	1
7	1	1	1	1	1

5.



6.

$$\begin{aligned}
 f(a,b,c) &= D0(\bar{a}\bar{b}\bar{c}) + D1(\bar{a}\bar{b}c) + D2(\bar{a}b\bar{c}) + D3(\bar{a}bc) \\
 &\quad + D4(a\bar{b}\bar{c}) + D5(a\bar{b}c) + D6(ab\bar{c}) + D7(abc) \\
 &= (\bar{a}\bar{b})(\bar{a}\bar{b}\bar{c}) + (\bar{a}\bar{b})(\bar{a}\bar{b}c) + (\bar{a}b)(\bar{a}b\bar{c}) + (\bar{a}b)(\bar{a}bc) \\
 &\quad + (\bar{c}b)(ab\bar{c}) + (\bar{c}b)(abc) + (cb)(ab\bar{c}) + (cb)(abc) \\
 &= \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}c + abc
 \end{aligned}$$

	C			
ab	1			
	1		1	

$$= \bar{b}\bar{c} + abc$$

or

Input			Output
a	b	c	f
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

$$\begin{aligned}
 f(a,b,c) &= \Sigma m(0,4,7) \\
 &= \bar{b}\bar{c} + abc
 \end{aligned}$$