

Tue Oct 15 2019

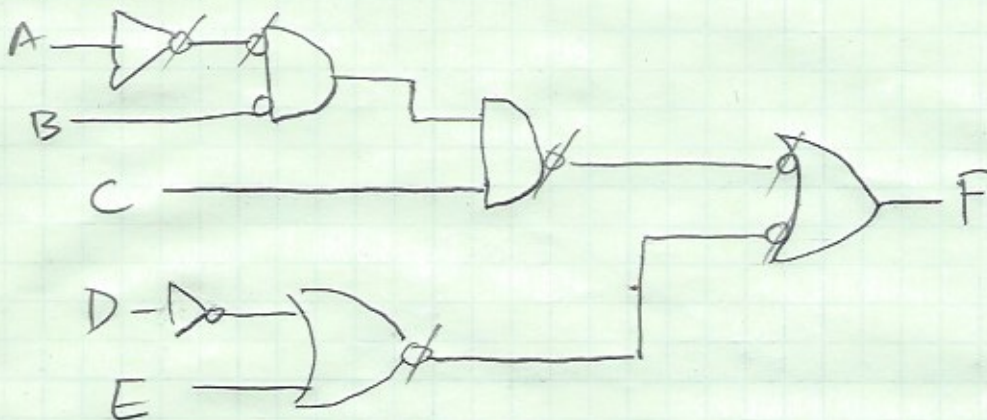
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Fri Oct 18 - There will be no lecture in LOZ.

Tutorials Oct 22 and Oct 29 will not have quizzes.

Exercise 1

Bubble-pushing



$$F = (A\bar{B}C) + (\bar{D} + E) = A\bar{B}C + \bar{D} + E$$

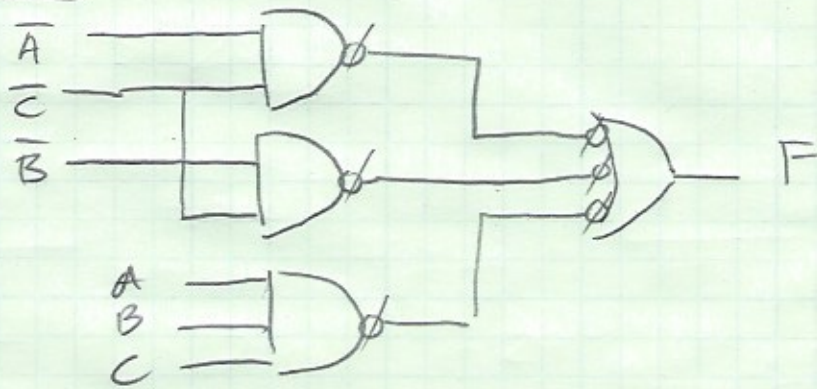
Algebra - refer to the schematic on the slide

$$F = \overline{\overline{(\overline{A+B})(C)}} \overline{(\bar{D} + E)}$$

$$= \overline{((\bar{A} + \bar{B})C)} + (\bar{D} + E)$$

$$= (A\bar{B})C + (\bar{D} + E) = A\bar{B}C + \bar{D} + E$$

Exercise 2



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$$F = \bar{A}\bar{C} + \bar{B}\bar{C} + ABC$$

Fact Two level NAND-NAND logic can be used to implement SOP expressions just like two AND-then-OR logic.

Exercise 3

A	B	E ₁	E ₂	Y	reason
0	1	0	0	Z	neither tristate is driving Y
0	1	0	1	0	$Y = \bar{B}$
0	1	1	0	1	$Y = \bar{A}$
1	0	0	1	1	$Y = \bar{B}$
1	0	1	1	X	contention between tristate outputs
1	1	1	1	0	tristates <u>both</u> driving Y to 0

Exercise 4 K-map

$$F = \sum (m_4, m_5, m_6, m_7)$$

		00	01	11	10
AB \ C	0			1	1
	1			1	1

$$F = A$$

Algebra

$$\begin{aligned} & \overline{A}\overline{B}C + A\overline{B}C + AB\overline{C} + ABC \\ &= \overline{A}\overline{B} + AB \\ &= A \end{aligned}$$

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Exercise 5

		00	01	11	10
C	0		1	1	1
	1		1	1	1


Extra question


Are the PI's EPI's?

Yes both are EPI's.

Another extra question What are the implicants that are not PI's.

groups of 1 (minterms) : 6

groups of 2 (horizontal)  : 4

groups of 2 (vertical)  : 3

total 13

Exercise 6

		00	01	11	10
CD	00				
	01		1*	1	1*
	11	1*	1	1	1
	10	1*	1*	1*	1*

BD (green oval), AD (blue oval), C (red oval)

EPI's C, BD, AD

Because the EPI's cover all the 1-cells,

$$F = C + BD + AD$$

is a unique minimal SOP expression.