Lecture 3

Friday, September 4, 2015 10:04

2-to-4 Decoder
2-to-6 circuit, parity circuit

I0	I1	q
0	0	1
0	1	0
1	0	0
1	1	1

$q = \bar{i}_0 \cdot \bar{i}_1 + i_0 \cdot i_1$
row 0 row 3

$q = \bar{i}_0 \cdot \bar{i}_0 + i_0 \cdot i_1$
$= (\bar{i}_0 \cdot i_1) \cdot (i_0 \cdot \bar{i}_1)$
$= (i_0 \cdot \bar{i}_1) \cdot (\bar{i}_0 + i_1)$

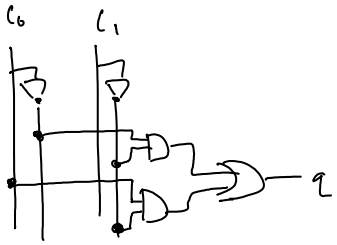
DNF
Disjunctive Normal Form

Disjunctive normal form

DNF $= (\cdot\,\cdot) + (\cdot\,\cdot) + \ldots + (\cdot\,\cdot)$
CNF $= (+\,+) \cdot (+\,+) \cdot \ldots \cdot (+\,+)$ ← conjunctive normal form

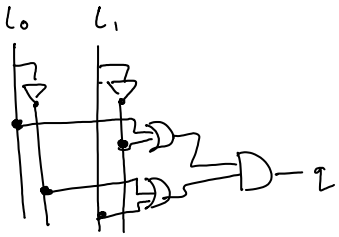
DNF

$q = \bar{i}_0 \cdot \bar{i}_1 + i_0 \cdot i_1$



CNF

$q = (i_0 + \bar{i}_1) \cdot (\bar{i}_0 + i_1)$



might not be simplest circuit

	x	y	z	F
a	0	0	0	0
b	0	0	1	1
c	0	1	0	0
d	0	1	1	0
e	1	0	0	1
f	1	0	1	1
g	1	1	0	0
h	1	1	1	0

make circuit
↳ DNF or CNF?
↳ because fewer 1's than 0's

$F = (\bar{x}\bar{y}z)_{b} + (x\bar{y}z)_{e} + (x\bar{y}z)_{f}$

Don't minimize circuit, for HW reasons, might be 40 options.
(REAL WORLD) use algebra to minimize circuit

Step 1, truth table → decide DNF or CNF
2, go through the rows
3, CNF → DNF, or w.e. if necessary

CNF

$F = (\bar{x}\bar{y}\bar{z}) + (x\bar{y}z) + (\bar{x}yz) + (xy\bar{z}) + (xyz)$
$= (x\bar{y}\bar{z}) \cdot (\bar{x}y\bar{z}) \cdot (\bar{x}yz) \cdot (xy\bar{z}) \cdot (xyz)$
$= (x+y+z) \cdot (x+\bar{y}+z) \cdot (\bar{x}+y+z) \cdot (\bar{x}+\bar{y}+z) \cdot (\bar{x}+\bar{y}+\bar{z})$

WATCH SELECT DNF

WATCH SERGIO DNF

Be able to take any truth table and turn it into a circuit

ADDING

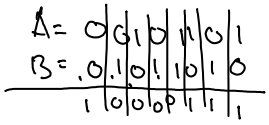
half-adder

A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

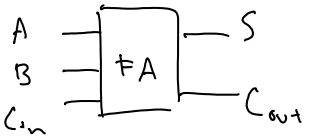
carry

$S = \bar{A} \cdot B + A \cdot \bar{B}$

$C = A \cdot B$



like normal addition



carry in full-adder carry out