

CS251 - Lecture 3

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Truth Tables:

x	y	F
0	0	0
0	1	1
1	0	1
1	1	0

1. Define F to be 0,1 depending on the input values
2. F is true based on 2
3. Output function for F, $F = \bar{X}Y + X\bar{Y}$ - XY terms are minterms
4. Take this: Sum of Products build a Circuit

n inputs { \equiv $\square \equiv$ } m outputs

Above is the circuit that implements the output functions

4 bit binary numbers:

$$\begin{aligned} & \bar{2}^3 \bar{2}^2 \bar{2}^1 \bar{2}^0 \\ &= 2^0 \times 1 + 2^1 \times 1 + 2^2 \times 1 + 2^3 \times 1 \\ &= 15 \end{aligned}$$

Course notes Slide 2-2:

$$F = \bar{X}\bar{Y}Z + X\bar{Y}Z + XY\bar{Z} + XYZ$$

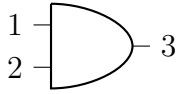
There are 4 minterms above

$$\bar{G} = XYZ$$

$$G = X\bar{Y}Z$$

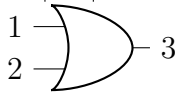
Hardware

Gates



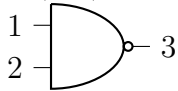
AND

x	y	F
0	0	0
0	1	0
1	0	0
1	1	1



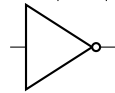
OR

x	y	F
0	0	0
0	1	1
1	0	1
1	1	1



NAND

x	y	F
0	0	1
0	1	1
1	0	1
1	1	0



NOT

x	F
0	1
1	0
0	1
1	0

More Truth Tables

Don't Cares slide 2-6

x = 0, or 1 does not matter

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

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

$$F = \bar{A}B$$

The last line is a reduced function, we can remove anything that is true no matter what.

Using Overlapping Non-minimal Terms

(slide 2-8)

A	B	C	F
...			
1	0	0	0
1	X	1	1
1	1	X	1

break

