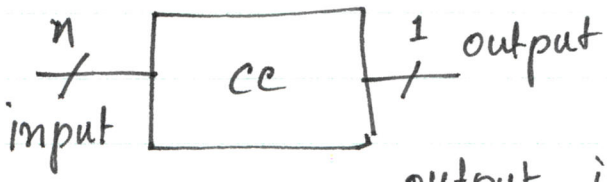
CSE241 ① Feb 10, 2017

1. combinational circuit (cc)

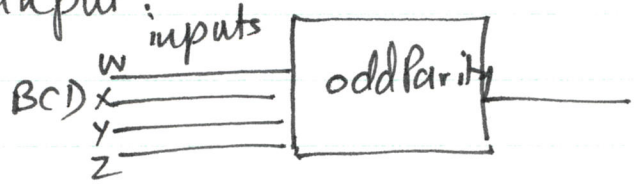


output is dependent only on the inputs for a given cc

2. BCD
Binary Coded Decimal
4 bit binary representing a decimal digit

decimal digit $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

3. Find the odd ~~pri~~ parity for the BCD input:



4. What is parity? parity bit? odd parity bit?

5. Truth Table

Truth Table odd "BCD"

	w	x	y	z	p	
0	0	0	0	0	1	m_0
1	0	0	0	1	0	m_1
2	0	0	1	0	0	m_2
3	0	0	1	1	1	m_3
4	0	1	0	0	0	m_4
5	0	1	0	1	1	m_5
6	0	1	1	0	1	m_6
7	0	1	1	1	0	m_7
8	1	0	0	0	0	m_8
9	1	0	0	1	1	m_9

other combinations of 1's, 0's do not occur in the input

write the Boolean expression.

$f(w,x,y,z) = \sum(m_0, m_3, m_5, m_6, m_9)$

$= w'x'y'z' + w'x'yz + w'xy'z + w'xyz' + wx'y'z$

simplify this.

5 terms | 5×4 = 20 literals

Goal of simplification:
Minimize # of terms
Minimize # of literals

$f(w,x,y,z) = w'x'y'z' + w'x'yz + w'xy'z + w'xyz' + wx'y'z$

$= w'x'(y'z' + yz) + w'x(y'z + yz') + wx'y'z$

$w'x'y'z' + w'x'yz + w'y'z(x+x') + w'xyz'$

$= w'x'y'z' + w'z(x'y' + y') + w'xyz'$ (1)

$= w'x'y'z' + w'z((x'+y').(y+y')) + w'xyz'$

$w'x'(y'z' + yz) + w'x(y'z + yz') + wx'y'z$

$w'x'.(y \oplus z)' + w'x.(y \oplus z) + wx'y'z$

We'll repeat this with K-map & don't cares

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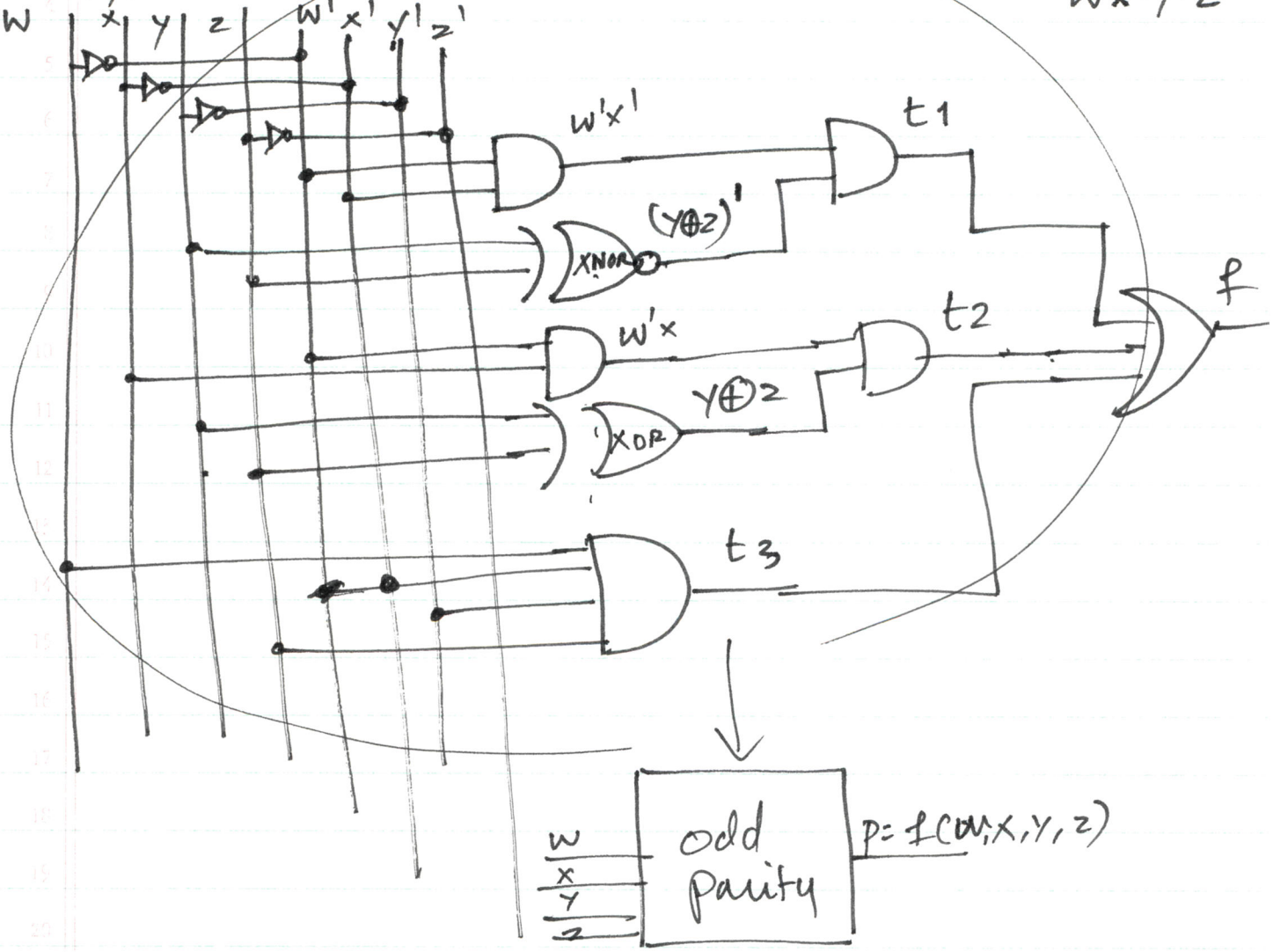
Implement.

$f(w,x,y,z) = w'x'(y \oplus z)' + w'x \cdot (y \oplus z) + wx'y'z$



Lab1: {AND, OR, NOT} gates to implement logic expressions.

"NAND" gate

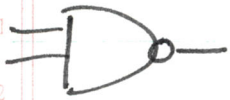
$f(a,b,c) = \cancel{a'bc + ac}$

$= a'b + ac + cb$

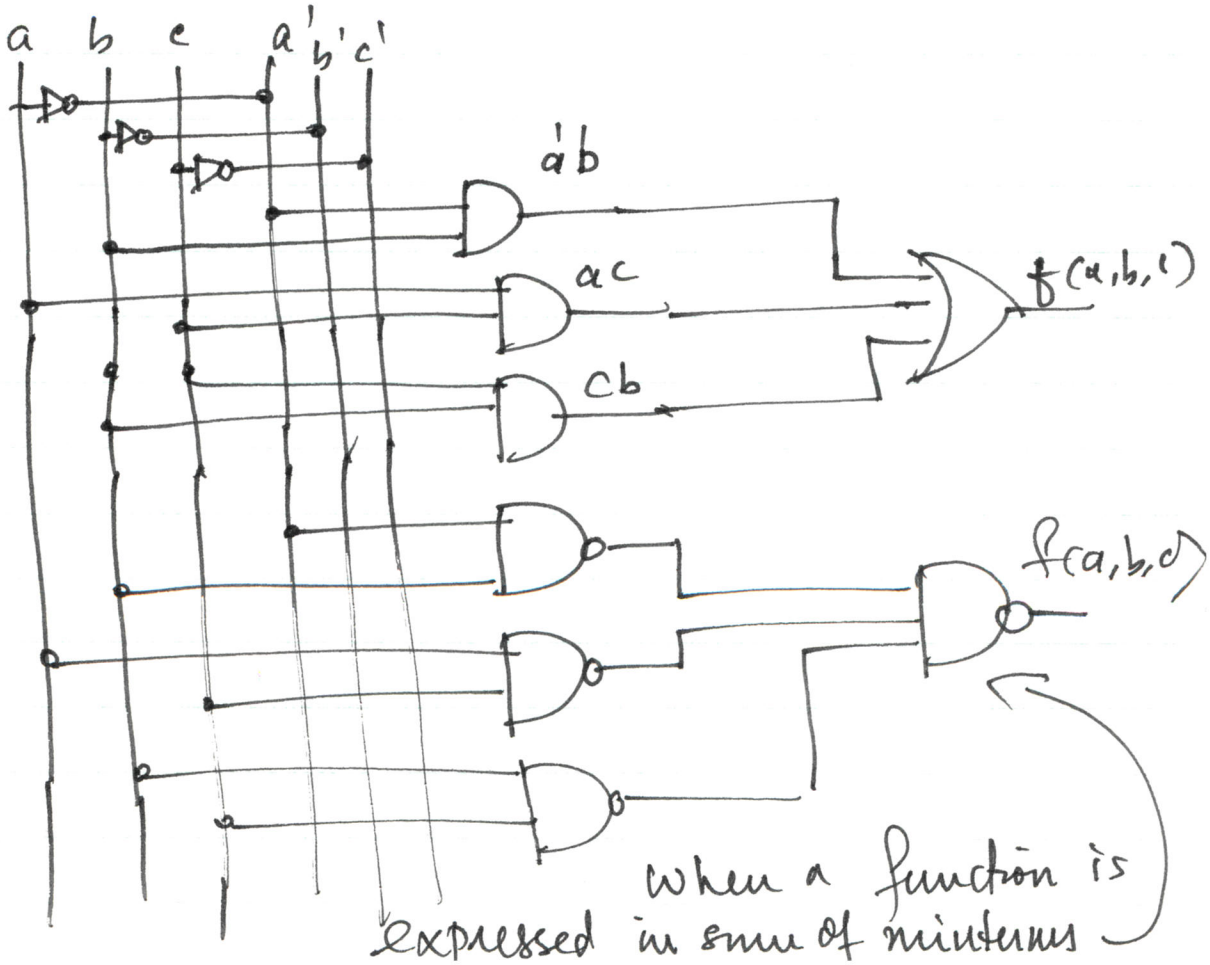
Implement this using (i) {AND, OR, NOT}
(ii) NAND only

What is NAND?

~~x~~	~~y~~	NAND
0	0	1
0	1	1
1	0	1
1	1	0



X	Y	AND
0	0	0
0	1	0
1	0	0
1	1	1



When a function is expressed in sum of minterms