CSE241 March 1, 2017

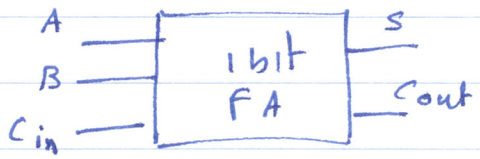
Mid Term Exam 3/13/2017
During lecture 50 min exam
we will review next week

CSE241 ~~let~~ Office hours are pinned

Full Adder : MSI Medium Scale Integration

1-bit full adder (FA) ≈ 10 - 100 gate complexity
4-bit FA

1. Block diagram



2. Truth Table

	inputs A	B	C_{in}	outputs S	Cout
m_0	0	0	0	0	0
m_1	0	0	1	1	0
m_2	0	1	0	1	0
m_3	0	1	1	0	1
m_4	1	0	0	1	0
m_5	1	0	1	0	1
m_6	1	1	0	0	1
m_7	1	1	1	1	1

add

$p \oplus q = (p \odot q)'$

$S(A, B, C_{in}) = \sum(1, 2, 4, 7)$

A \ BCin	00	01	11	10
0	0	1 1	3	2 1
1	4 1	5	7 1	6

$= A'B'C_{in} + A'BC_{in}' + AB'C_{in}' + ABC_{in}$

$= C_{in}'(A'B + AB') + C_{in}(A'B' + AB)$

$= C_{in}'(A \oplus B) + C_{in}(A \odot B)$

$= C_{in}'(X) + C_{in}(X)'$

$= C_{in}'X + C_{in}X'$

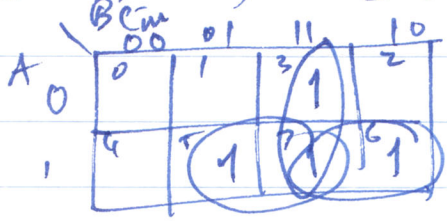
$= C_{in} \oplus X = C_{in} \oplus (A \oplus B)$

$C_{in} \oplus A \oplus B$ (Sum)

CSE 241

March 1, 2017

$C_{out}(A, B, C_{in}) = \sum(m_3, m_5, m_6, m_7)$



Take 1:

$C_{out} = BC_{in} + AC_{in} + AB$

Okay

Take 2: I understand we have some XOR's in the co-located functions. Can we derive another function for Cout that has XOR's?

m_3 m_5 m_6

$A'BC_{in} + AB'C_{in} + ABC_{in}' + ABC$

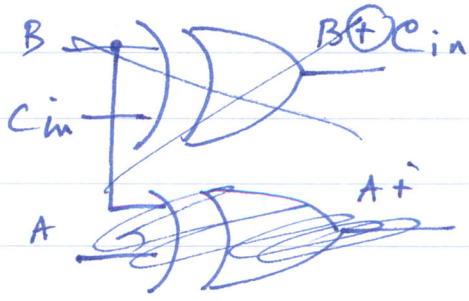
$A(B'C_{in} + BC_{in}')$

$BC(A'+A)$ → 1

$A(B \oplus C_{in}) + BC$

$C_{out}(A, B, C_{in}) = A \cdot (B \oplus C_{in}) + BC$

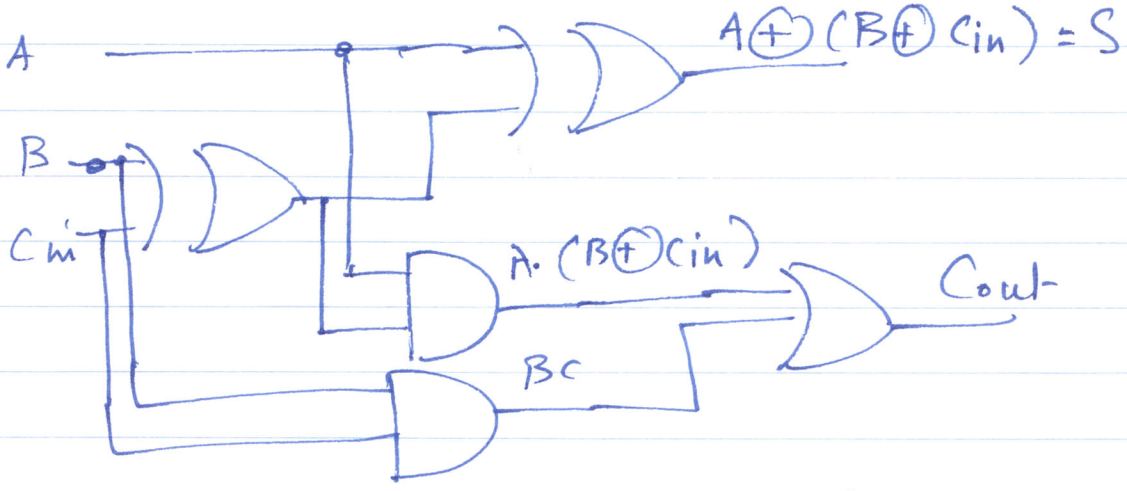
Draw the circuit or implement the circuit.



Draft

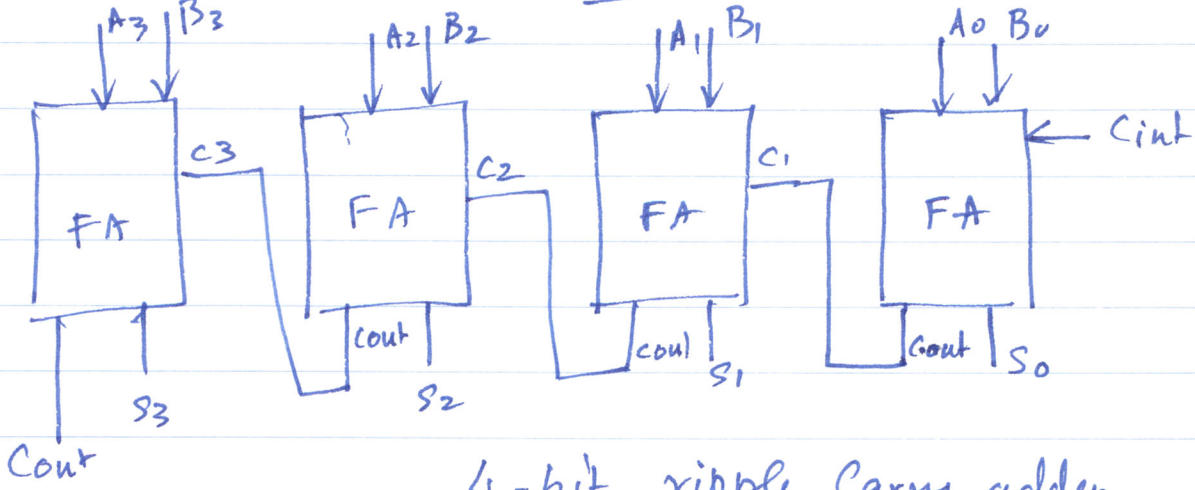
March 1, 2017

~~Ex~~ (3)

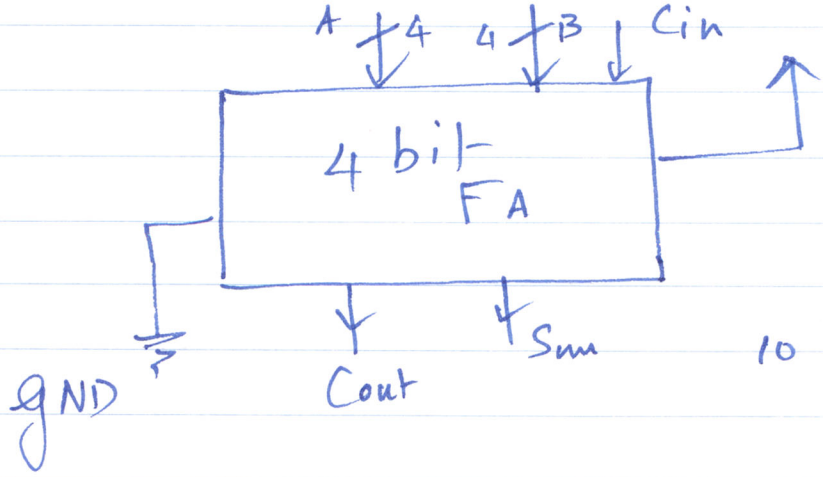


1-bit full adder (FA)

The chip is 4-bit FA IC MSI



4-bit ripple Carry adder



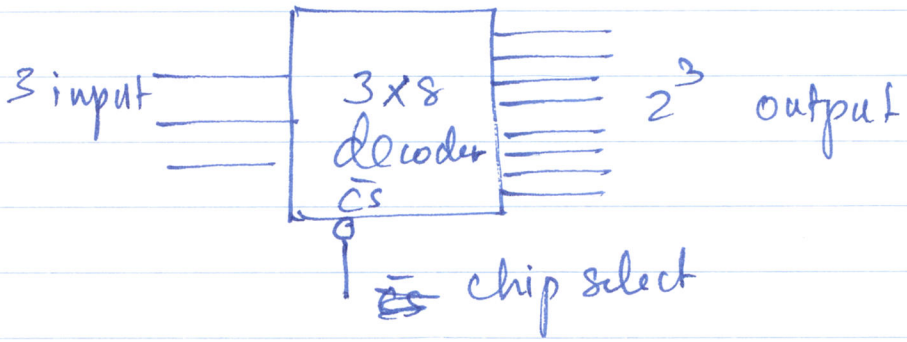
20 gates complexity

10 100

March 1, 2017

Decoder: MSI chip

Motivation → address decoding is an important application



De_Morgan's law: applied $(\ )'$ when you have a primed term or expression

Problem $(AB + B'C')'$ transform this into a Standard sum of products form.

↓ DM - 1

$(A \cdot B)' \cdot (B' \cdot C')'$

↓ DM - 2 times

$(A' + B') \cdot (B + C)$

$A'B + A'C + B \cdot \bar{B} + B'C$

$\bar{B} \cdot B = 0$

$A'B + A'C + B'C$ //