Combinational Logic Design with Decoder

Decoder

n → 2^n inverting output

n → 2^n Non inverting

Logic function

Cannonical SOP form

Cannonical POS form

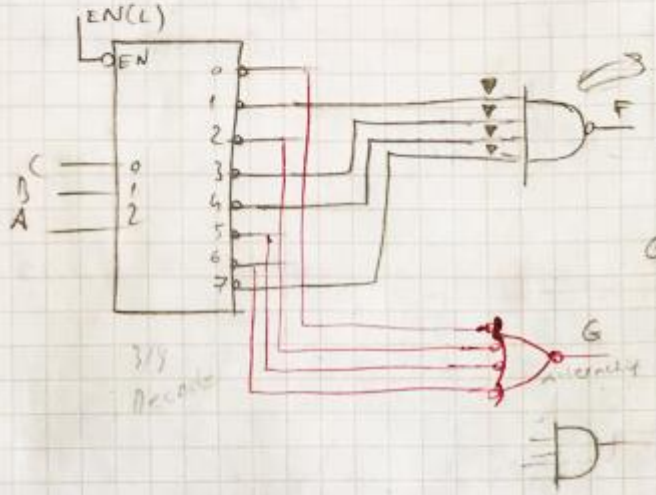
OSOW

$F(A,B,C) = \sum m(1,3,4,7)$

$G(A,B,C) = \prod M(0,2,5,6)$

$\overline{F} = M_1$

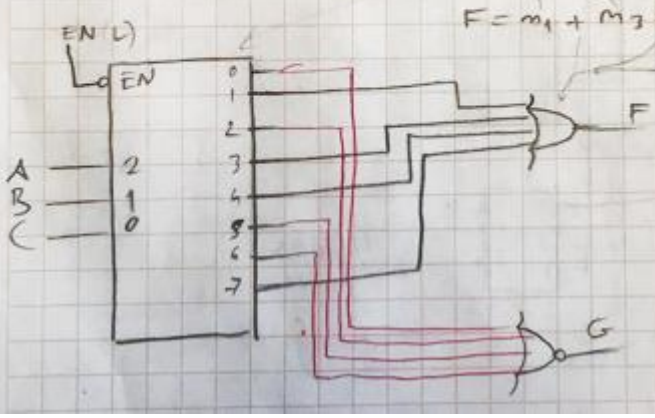
$F = m_1 + m_3 + m_4 + m_7 = \overline{M_1 \cdot M_3 \cdot M_4 \cdot M_7}$ NAND



$G = M_0 \cdot M_2 \cdot M_5 \cdot M_6$

Evirmeyen şekilli yapalım

$F = m_1 + m_3 + m_4 + m_7$



$G = M_0 M_2 M_5 M_6$

$= \overline{m_0 + m_2 + m_5 + m_6}$

Arithmetic Circuits

Half Adder

Full Adder

Full Subtracter.

Multiplier

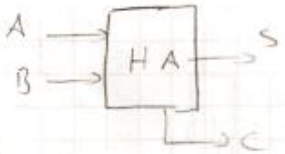
Divider

Comparator

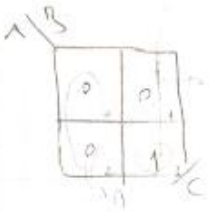
OSOW

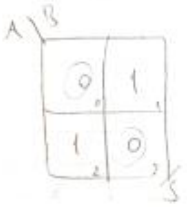
a) wyłącznie NAND
b) " NOR

Half Adder



	A	B	C	S
0	0	0	0	0
1	0	1	0	1
2	1	0	0	1
3	1	1	1	0



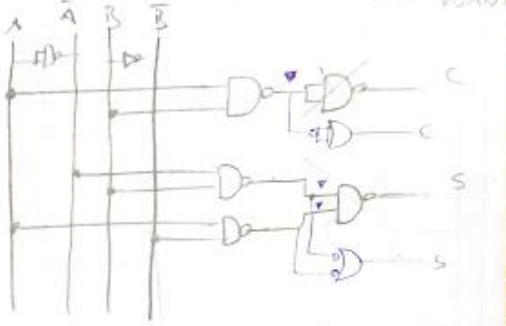


a) $C = AB$

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

$C = \overline{\bar{A}\bar{B}}$

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



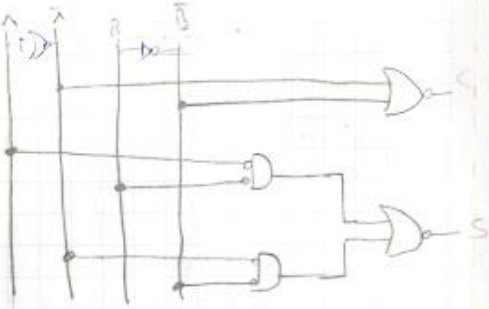
b) $C = A \cdot B$

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

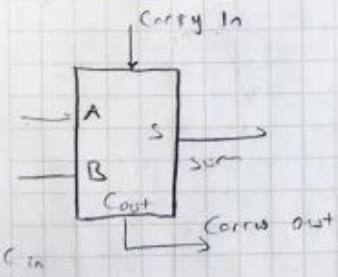
$C = \overline{\bar{A} \cdot \bar{B}} = \bar{\bar{A}} + \bar{\bar{B}}$

$S = \overline{(A+B) \cdot (\bar{A}+\bar{B})} =$

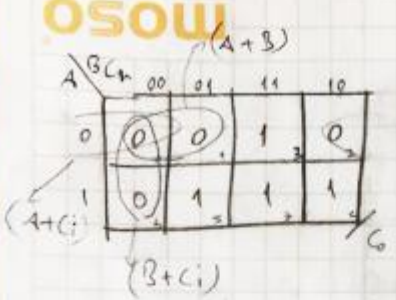
$= \overline{\bar{A}+B} + \overline{\bar{A}+\bar{B}}$

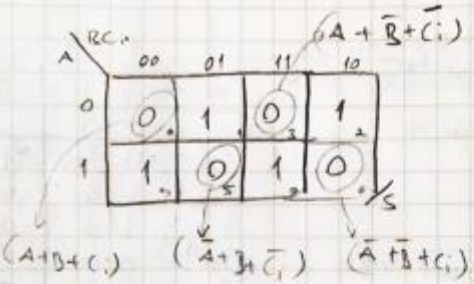


Full Adder



Dec	A	B	Cin	Cout	S
0	0	0	0	0	0
1	0	0	1	0	1
2	0	1	0	0	1
3	0	1	1	1	0
4	1	0	0	0	1
5	1	0	1	1	0
6	1	1	0	1	0
7	1	1	1	1	1



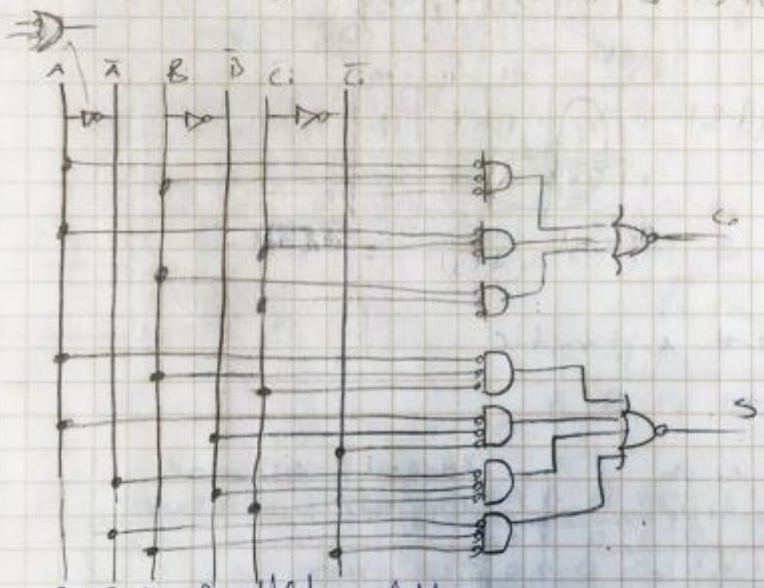


$$C_o = (A+B)\cdot(A+C_i)\,(B+C_i)$$

$$= \overline{(A+B)+(A+C_i)+(B+C_i)}$$

$$S = (A+B+C_i)\cdot(A+\bar{B}+\bar{C_i})\cdot(\bar{A}+\bar{B}+C_i)(\bar{A}+B+\bar{C_i})$$

$$\overline{(A+B+C_i)+(A+\bar{B}+\bar{C_i})+(\bar{A}+\bar{B}+C_i)+(\bar{\bar{A}}+B+\bar{C_i})}$$



n Bit Parallel Adder