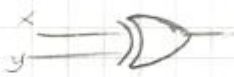
EXOR = XOR Gate

	x y	f = x⊕y
0	0 0	0
1	0 1	1
2	1 0	1
3	1 1	0

$f = x\bar{y} + \bar{x}y = x \oplus y$



Equivalence = EXNOR = EQV

	x y	f = x⊙y
0	0 0	1
1	0 1	0
2	1 0	0
3	1 1	1

$f = x \odot y = x \cdot y + \bar{x} \cdot \bar{y}$

OSOW Controlled Logic level conversion.

$f = x \oplus y = x \cdot \bar{y} + \bar{x} y$

$f = x \cdot y + x \cdot \bar{y}$

1 $= \bar{x}$ Conversion Mode ← 0 $f = \bar{x}$

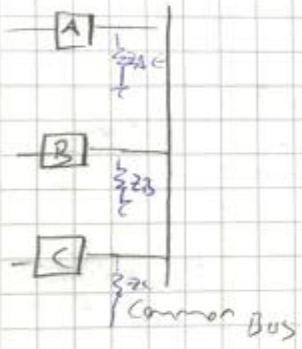
0 x Transfer Mode ← 1 $f = x$

Buffer

x	y
0	0
1	1

→ Sinyalleri seviyesini değiştirmeden ideal hale getiriy.

Tristate Gates



$\frac{1}{Z_{01}} = \frac{1}{Z_A} + \frac{1}{Z_B} + \frac{1}{Z_C}$

Tristate Buffer

$\bar{E}$	F
0	X
1	Hi-Z

↓ Yüksek empedans

E	F
0	Hi-Z
1	X

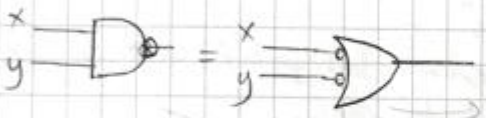
CONJUGATE GATE SYMBOL
(ALTERNATE GATE SYMBOL)

De Morgan

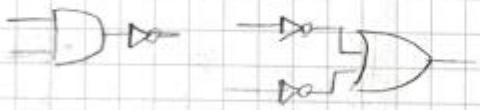
1. operatör değiştirilir
2. Giriş ve çıkışlar tümleyeni alınır

$$\overline{(x \cdot y)} = (\bar{x} + \bar{y})$$

$$(x \cdot y)(\bar{1}) = (\bar{x} + \bar{y})(H)$$



→ Bu durum alternate Gate symbol'dür

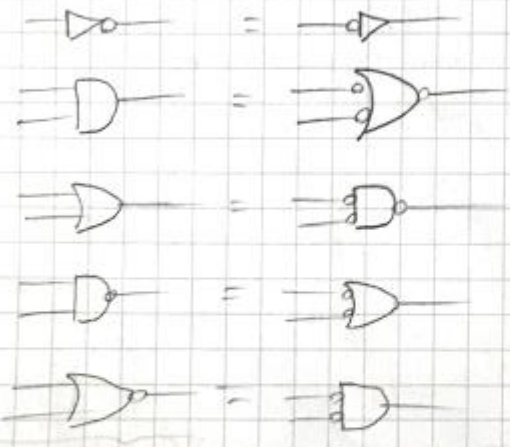


Standard Gate Symbol

⇓

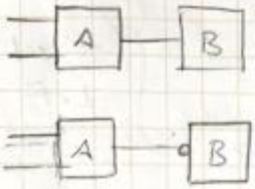
Alternate Gate symbol

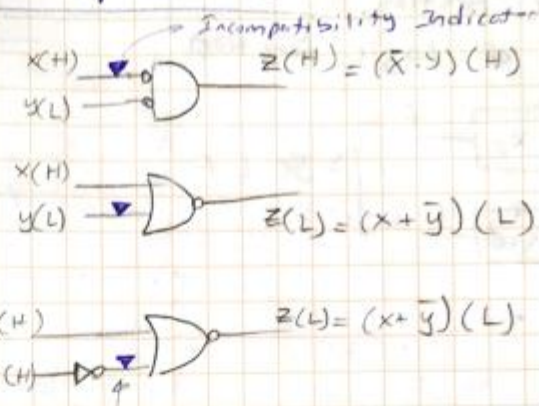
$$\overline{x+y} = \bar{x} \cdot \bar{y}$$



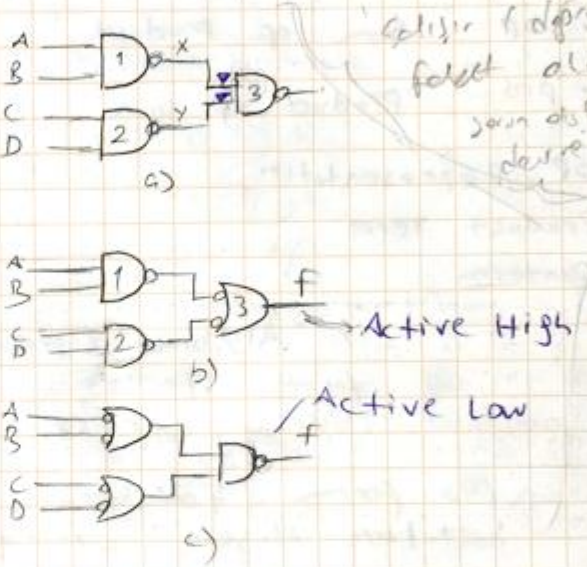
Standard = Alternate.

Logic Level Incompatibility



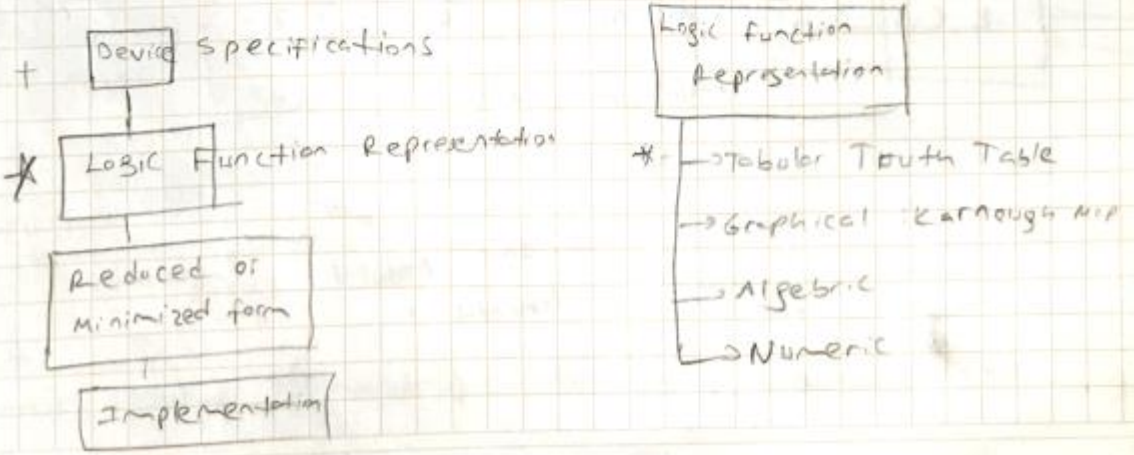


dec	A	B	C	D	f
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	0
3	0	0	1	1	1
4	0	1	0	0	0
5	0	1	0	1	0
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	0
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	1
12	1	1	0	0	1
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	1

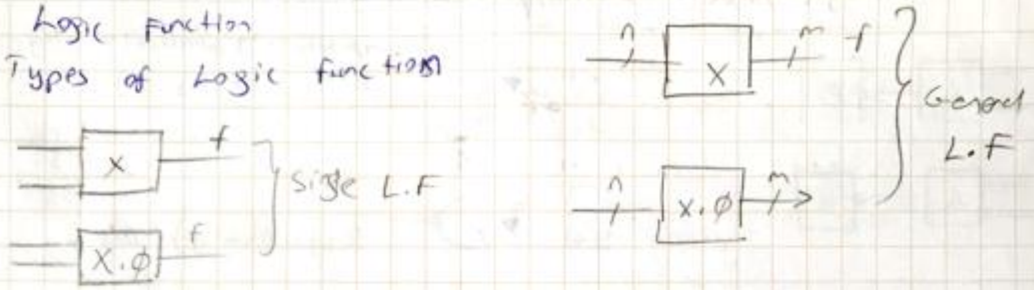


Alternative sembolleri kullanarak logic uygulamasını kolaylaştırır.

LOGIC FUNCTION



Logic Function
Types of Logic functions



Algebric Representation

- SOP Sum of product
- POS Product of sum

SOP Representation
Product Term
Minterm

Algebric Representation

SOP → SOP form fonksiyonun Logic 1 değerini aldığı noktalara ilişkin bir gösterimi

POS → POS form fonksiyonun Logic 0 değerini aldığı noktalara ilişkin bir gösterim

SOP presentation:

- A, B, C Literal
- AB, AC, BC, $\bar{A}B$, $A\bar{C}$, $\bar{B}\bar{C}$ } Product Term
- ABC, $\bar{A}BC$, $A\bar{B}C$, ... $\bar{A}\bar{B}\bar{C}$

→ minterm → Girişleri 3'ünü de içeriyor ise minterm değil

Cannonical product term
Fundamental " "

Minterm = cannonical product term = fundamental product term

minterm code

Uncomplemented variable X logic 1

Complemented variable $\bar{X}$ logic 0

$m_i = \bar{A}BC = m_3$

$(011) \rightarrow 3$

↓

Cannonical SOP form → Eğer çarpım terimlerinin tümü minterm ise buna denir..

örnek

$f(A,B,C) = \bar{A}B\bar{C} + AB\bar{C} + \bar{A}BC + ABC$

Cannonical sop form $(010) + (110) + (011) + (111)$

$\;\;\;\;2 \;\;\;\; 6 \;\;\;\; 3 \;\;\;\; 7$

$\;\;\;\;m_2 \;\;\;\; m_6 \;\;\;\; m_3 \;\;\;\; m_7$

Numerical Representation $= m_2 + m_3 + m_6 + m_7$

$= \sum m(2,3,6,7)$

Logic fonksiyonlarının nümerik gösterimi

Minterm	DEC	A B C	
m_0	0	0 0 0	0
m_1	1	0 0 1	0
m_2	2	0 1 0	1
m_3	3	0 1 1	1
m_4	4	1 0 0	0
m_5	5	1 0 1	0
m_6	6	1 1 0	1
m_7	7	1 1 1	1

$f = \sum m(2,3,6,7)$

$f = \bar{A}B\bar{C} + \bar{A}BC\; AB\bar{C} + ABC$

Bu üç gösterimden hangisi elimizde değerlerine geçiş yapabiliriz

for Generating the Connical SOP form

$f(A,B,C) = A + \bar{B}C + \bar{A}BC$ → Cannonical'e çevirin

1) $X + \bar{X} = 1$

$f(A,B,C) = A(B+\bar{B})(C+\bar{C}) + (A+\bar{A})\bar{B}C + \bar{A}BC$

2) Distributive

$f(A,B,C) = ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + \bar{A}BC + \bar{A}B\bar{C}$

3) $X + X = X$

$f = ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC$

$f = \Sigma m(7,6,5,4,1,3)$

$f = \Sigma m(1,3,4,5,6,7)$

POS (Product of Sum) Representation

- $A, B, C, \bar{A}, \ldots \bar{C}$ literal
- $A+B, A+C, B+C, \bar{A}+B \ldots \bar{B}+\bar{C}$
- $A+B+C, A+\bar{B}+\bar{C}, \ldots \bar{A}+\bar{B}+\bar{C}$ } Sum Term / Maxterm

Maxterm M_i => Maxterm code

Complemented Variable $\bar{x}$ logic 1 } $\bar{A}+\bar{B}+C+\bar{D} = M_{13}$
Uncomplemented variable x logic 0 } 1 1 0 1

13

$\bar{m}_i = M_i$ $\quad m_5 = A\bar{B}C$

$\bar{M}_i = m_i$ $\quad \bar{m}_5 = \overline{A\bar{B}C} = \bar{A}+B+\bar{C} \rightarrow M_5$

canonical POS form -> Bütün terimleri Maxterm ola

$f(A,B,C) = (A+B+\bar{C}).(\bar{A}+B+\bar{C})(\bar{A}+B+C).(A+B+C)$

0 0 1 $\quad$ 1 0 1 $\quad$ 1 0 0 $\quad$ 0 0 0

$M_1 \quad M_5 \quad M_4 \quad M_0$

$= \overline{\Pi} M(0,1,4,5)$

Dec	A	B	C	f
0	0	0	0	0
1	0	0	1	0
2	0	1	0	1
3	0	1	1	1
4	1	0	0	0
5	1	0	1	0
6	1	1	0	1
7	1	1	1	1

Conversion Between POS and SOP forms

1) from SOP to POS form

$f(x,y,z) = x\bar{z} + \bar{x}y + \bar{y}z$

De Morgan teoremini:

$f(x,y,z) = x\bar{z} + \bar{x}y + \bar{y}z \Rightarrow f^d(x,y,z) = (\bar{x}+\bar{z}).(x+\bar{y}).(y+\bar{z})$

$f^d(x,y,z) = \bar{x}\bar{y}\bar{z} + xyz$

$f^{dd}(x,y,z) = f(x,y,z) = (\bar{x}+\bar{y}+\bar{z}).(x+y+z)$

2) from POS to SOP form

$f(x,y,z) = (x+y)(\bar{x}+z) = x.\bar{x} + x.z + \bar{x}y + yz$

$= xz + \bar{x}y + yz$