Logic Gates

Lecture 08

COE211-Digital Logic Design

الفصل الدراسي الأول 1442-Fall2020

جامعة طيبة فرع ينبع - كلية علوم وهندسة الحاسبات – شطر الطالبات

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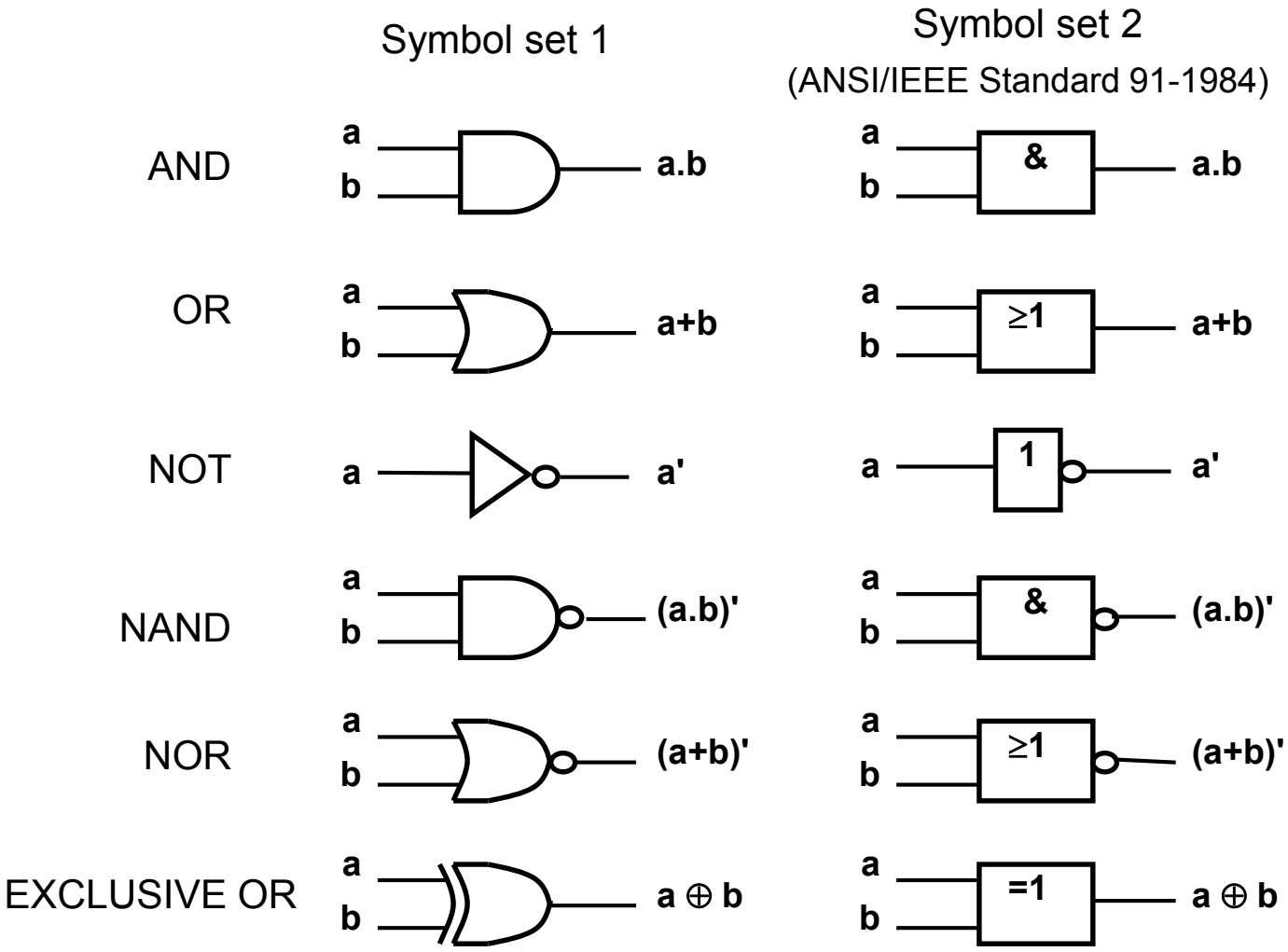
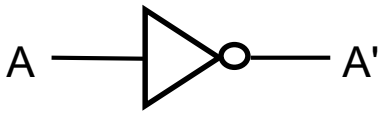
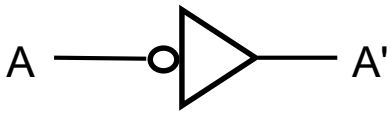
Symbols


Symbol set 1
Symbol set 2
(ANSI/IEEE Standard 91-1984)
AND
a
b
a.b
&
OR
a+b
≥1
NOT
a'
1
NAND
(a.b)'
NOR
(a+b)'
EXCLUSIVE OR
a ⊕ b
=1

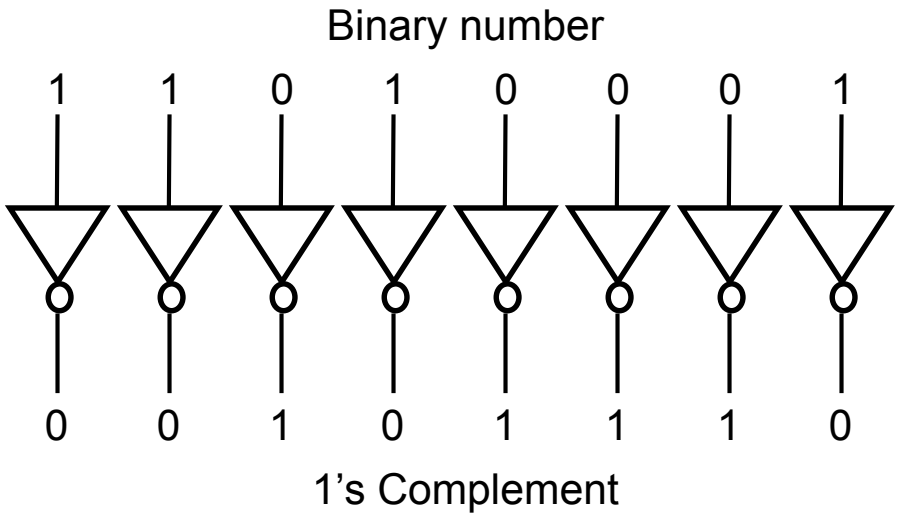
Inverter Gate



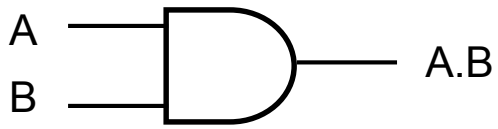


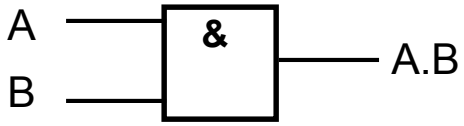
A	A'
0	1
1	0

- Application of the inverter: complement



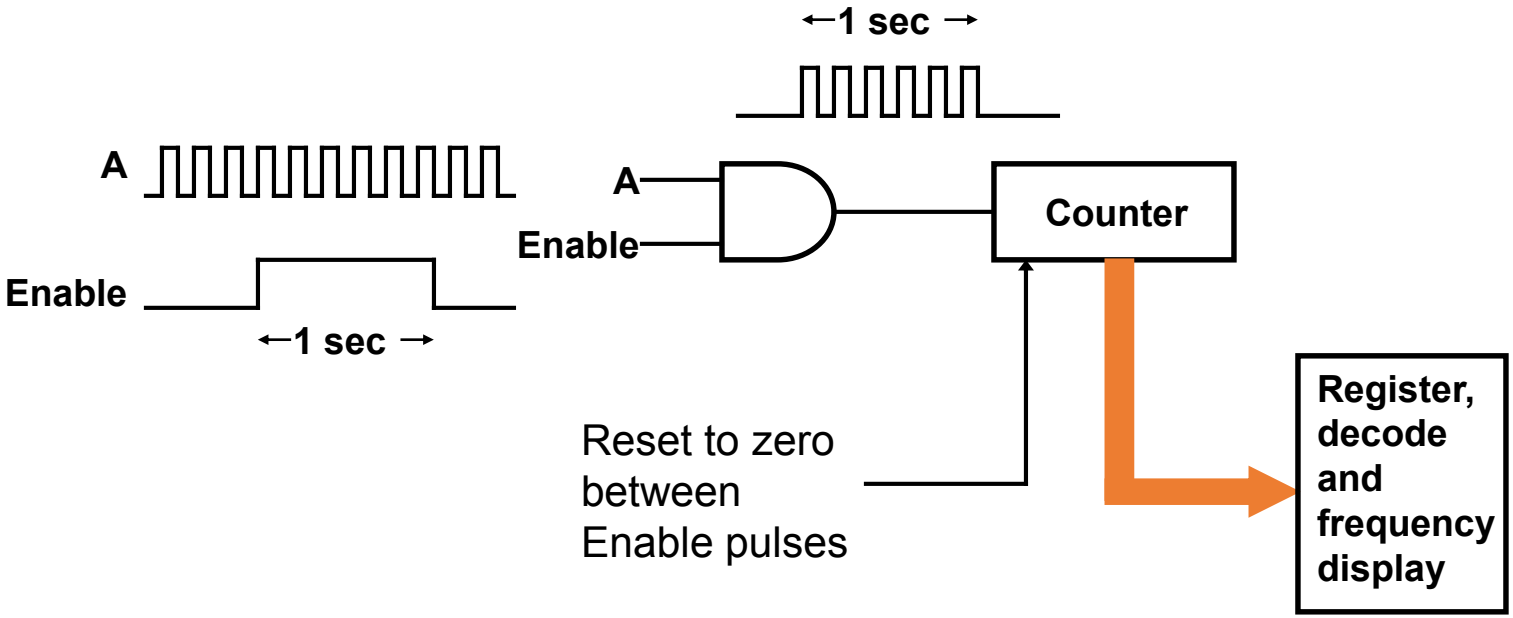
AND Gate





A	B	A . B
0	0	0
0	1	0
1	0	0
1	1	1

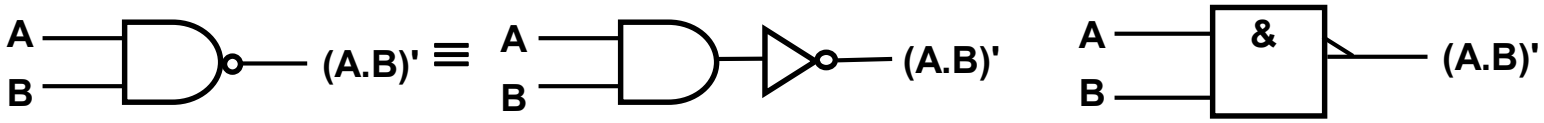
Application of AND Gate



OR Gate

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

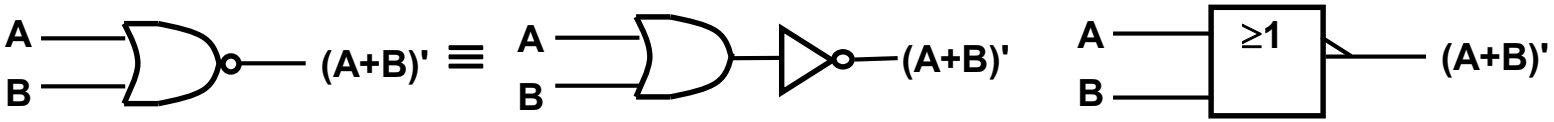
NAND Gate



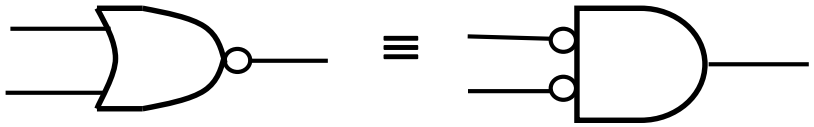
A	B	(A.B)'
0	0	1
0	1	1
1	0	1
1	1	0

NAND Negative-OR

NOR Gate

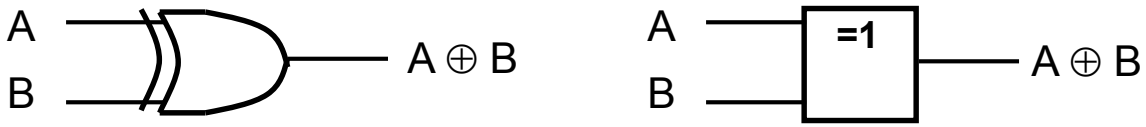


A	B	(A+B)'
0	0	1
0	1	0
1	0	0
1	1	0



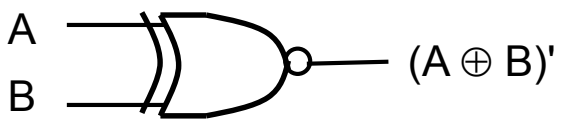
NOR Negative-AND

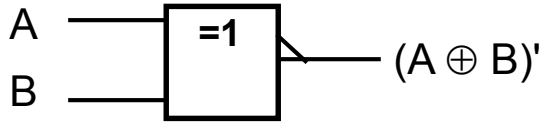
XOR Gate



A	B	A ⊕ B
0	0	0
0	1	1
1	0	1
1	1	0

XNOR Gate





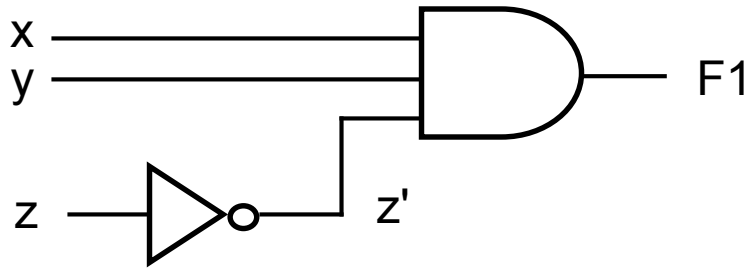
A	B	(A ⊕ B) '
0	0	1
0	1	0
1	0	0
1	1	1

Drawing Logic Circuit

- When a Boolean expression is provided, we can easily draw the logic circuit

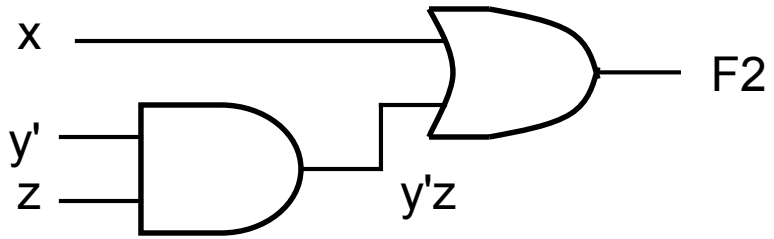
Example 1

- Draw the logic circuit of the following function:
  - F1 = xyz' (note the use of a 3-input AND gate)



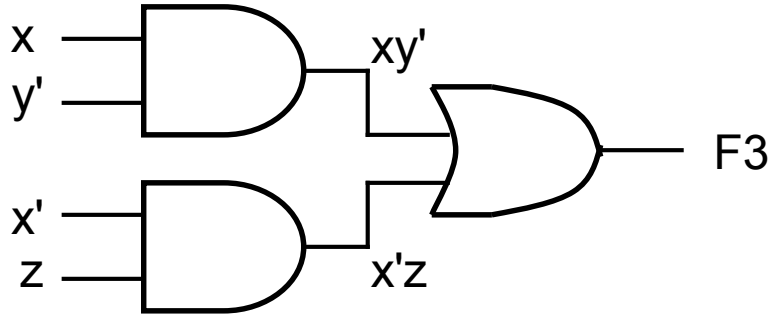
Example 2

- Draw the logic circuit of the following function:
  - F2 = x + y'z (can assume that variables and their complements are available)



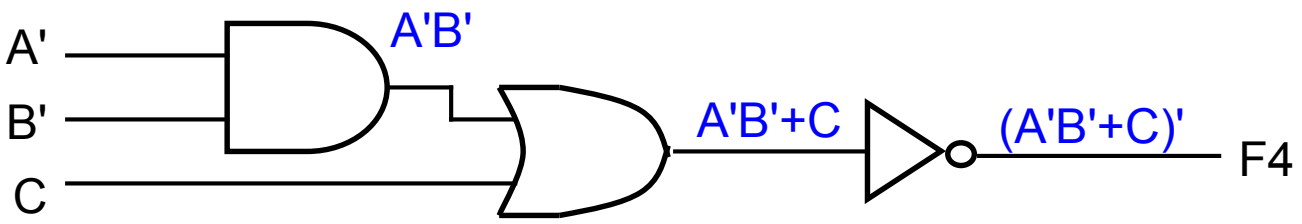
Example 3

- Draw the logic circuit of the following function:
  - F3 = xy' + x'z



Analyzing Logic Circuits

- When a logic circuit is provided, we can analyse the circuit to obtain the logic expression
- Example: What is the Boolean expression of F4?



$$F4 = (A'B'+C)' = (A+B).C'$$