

Chapter 4

BOOLEAN ALGEBRA AND THEOREMS, MINI TERMS AND MAXI TERMS

Lesson 1

BOOLEAN OPERATIONS

Outline

- **Truth Table**
- NOT, AND, OR Operations
- NAND, NOT Operations
- XOR, NOT-XOR, NOT-NOT operations

Table of n rows

A truth table has 2^n rows for 2^n combination of n inputs. It gives in each of its row m outputs for a given combination. It gives the logic output(s) after the logical operations under different conditions of the input(s).

Example- Truth Table 2 input 1 output

Inputs		Output
A1	A2	F
0	0	1
0	1	0
1	0	0
1	1	0

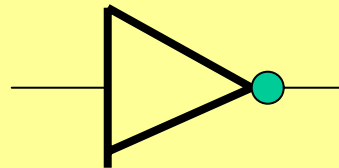
Outline

- Truth Table
- **NOT, AND, OR Operations**
- NAND, NOT Operations
- XOR, NOT-XOR, NOT-NOT operations

NOT— 1 input 1 output

Input	Output
A	F
0	1
1	0

$$F = \overline{A}$$

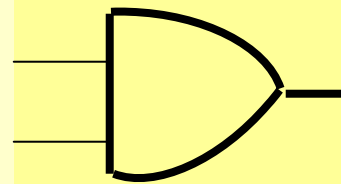


Symbol

AND — 2 input 1 output

Inputs		Output
Inputs		Y
0	0	0
0	1	0
1	0	0
1	1	1

$$F = A1. A2$$

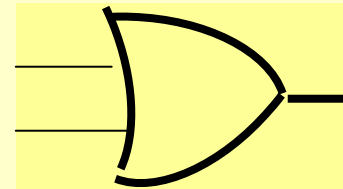


Symbol

OR— 2 input 1 output

Inputs		Output
A1	A2	F
0	0	0
0	1	1
1	0	1
1	1	1

$$F = A1 + A2$$



Symbol

Remember

NOT unique property is that output is high '1' if input is at low '0' logic level and output is low '0' if input is at high '1' logic level

AND unique property is that output is high '1' only if all of the inputs are at high '1' logic level

OR unique property is that output is high '1' when any of the input is at high '1' logic level

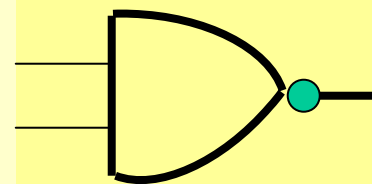
Outline

- Truth Table
- NOT, AND, OR Operations
- **NAND, NOR Operations**
- XOR, NOT-XOR, NOT-NOT operations

NAND — 2 input 1 output

Inputs		Output
A1	A2	Y
0	0	1
0	1	1
1	0	1
1	1	0

$$F = \overline{A1 \cdot A2}$$

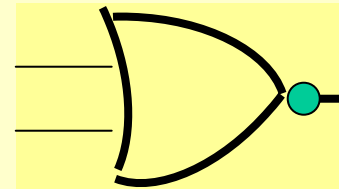


Symbol

NOR— 2 input 1 output

Inputs		Output
A1	A2	F
0	0	1
0	1	0
1	0	0
1	1	0

$$F = \overline{A1+A2}$$



Symbol

Remember

NAND unique property is that output is high '1' if any input is at low '0' logic level and output is low '0' if all inputs is at high '1' logic level

NOR unique property is that output is low '0' when any of the input is at high '1' logic level and output is high '1' if all inputs is at high '0' logic level

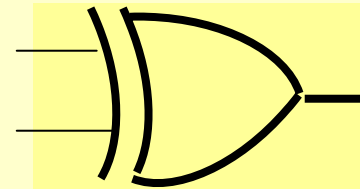
Outline

- Truth Table
- NOT, AND, OR Operations
- NAND, NO Operations
- **XOR, NOT-XOR, NOT-NOT operations**

XOR— 2 input 1 output

Inputs		Output
A1	A2	F
0	0	0
0	1	1
1	0	1
1	1	0

$$F = A1 \oplus A2$$

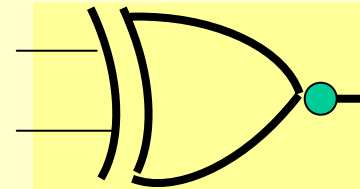


Symbol

NOT-XOR— 2 input 1 output

Inputs		Output
A1	A2	F
0	0	1
0	1	0
1	0	0
1	1	1

$$F = \overline{A1 \oplus A2}$$

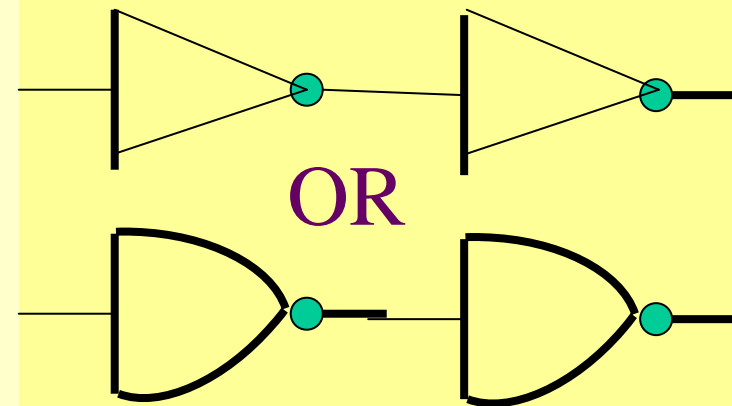


Symbol

NOT-NOT — 1 input 1 output

Inputs	Output
A	F
0	0
1	0

$$F = \overline{\overline{A}}$$



Symbol

Remember

An XOR has unique property that the output is '1' only if odd numbers of the input are '1's.

A NOT-XOR has unique property that the output is '0' only if odd numbers of the input are '1's.

NOT-NOT, also called Buffer — unique property is that output is at same logic level as input after a propagation delay

Summary

- NOT complements the input
- AND give output 1 only when all inputs 1s
- OR give output 0 only when all inputs 0s
- NAND e give output 0 only when all inputs 1s
- NOR give output 1 only when all inputs 0s
- XOR give output 1 only odd number of inputs 1s

End of Lesson 1

BOOLEAN OPERATIONS

THANK YOU