Class 02

Monday, October 4, 2021 9:04 PM

Boolean Algebra → discussion on boolean variables and logic

True/1 False/0

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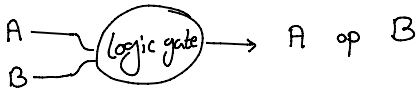
Logic Gates



Primary logic gate → AND, OR, NOT

AND

A	B	A·B
0	0	0
0	1	0
1	0	0
1	1	1

(A) 1 (B) 1 → 1

OR

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

NOT

A	$\bar{A}$
0	1
1	0

XOR

A	B	A⊕B
0	0	0
0	1	1
1	0	1
1	1	0

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

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Half Adder

Truth Table

A	B	O_1 SUM	O_2 CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

SUM = A⊕B

CARRY = A·B

0 → 0
1 → 1
2 → 10
3 → 11
4 → 100
⋮ ⋮

9
4
13

13/10 = 1

13 % 10 = 3

2/2 = 1

2 % 2 = 0

C =

C

0101[1] → 11
01100 → 12
10111 → 23

Full Adder

01100 → 12

10111 → 23

16 + 7

A	B	C_{in}	O_1 SUM	O_2 CARRY
0	0	0	0	0
0	1	0	1	0
1	0	0	1	0
1	1	0	0	1
0	0	1	1	0
0	1	1	0	1
1	0	1	0	1
1	1	1	1	1

H.W.

$$SUM = \bar{A}B\bar{C}_{in} + A\bar{B}\bar{C}_{in} + \bar{A}\bar{B}C_{in} + ABC_{in}$$

(001, 100, 011, 111)

$$= \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC$$

$$= \bar{C}(\bar{A}B + A\bar{B}) + C(AB + \bar{A}\bar{B})$$

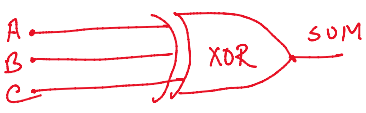
$$= \bar{C}(A \oplus B) + C\overline{(A \oplus B)}$$

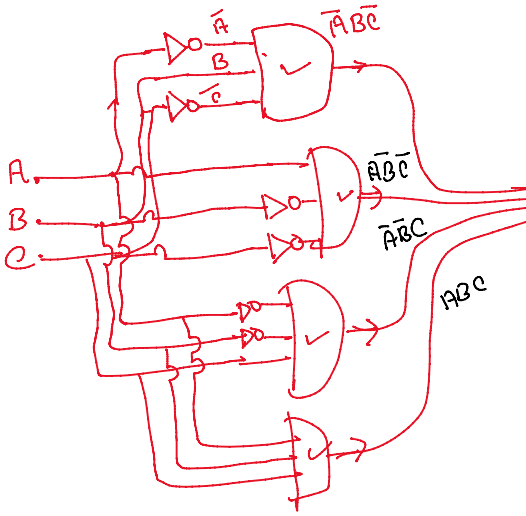
$$= \bar{C}X + C\bar{X}$$

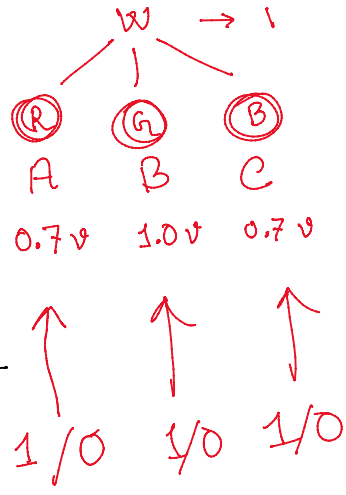
$$= C \oplus X$$

$$= C \oplus A \oplus B$$

$$= A \oplus B \oplus C$$







0.5 V 1.0 V 50.0 V

$\bar{0} \cdot 1 \cdot \bar{0} = 1$

$AB + \bar{A}\bar{B}$

A	B	$\overline{A \oplus B}$
0	0	1
0	1	0
1	0	0
1	1	1

$A + A = A$

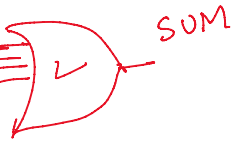
$A \cdot 1 = A$

$A + 1 = 1$

$A \cdot A = A$

$A + 0 = A$

$A \cdot 0 = A$


SUM

$A \cdot 0 = A$

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

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

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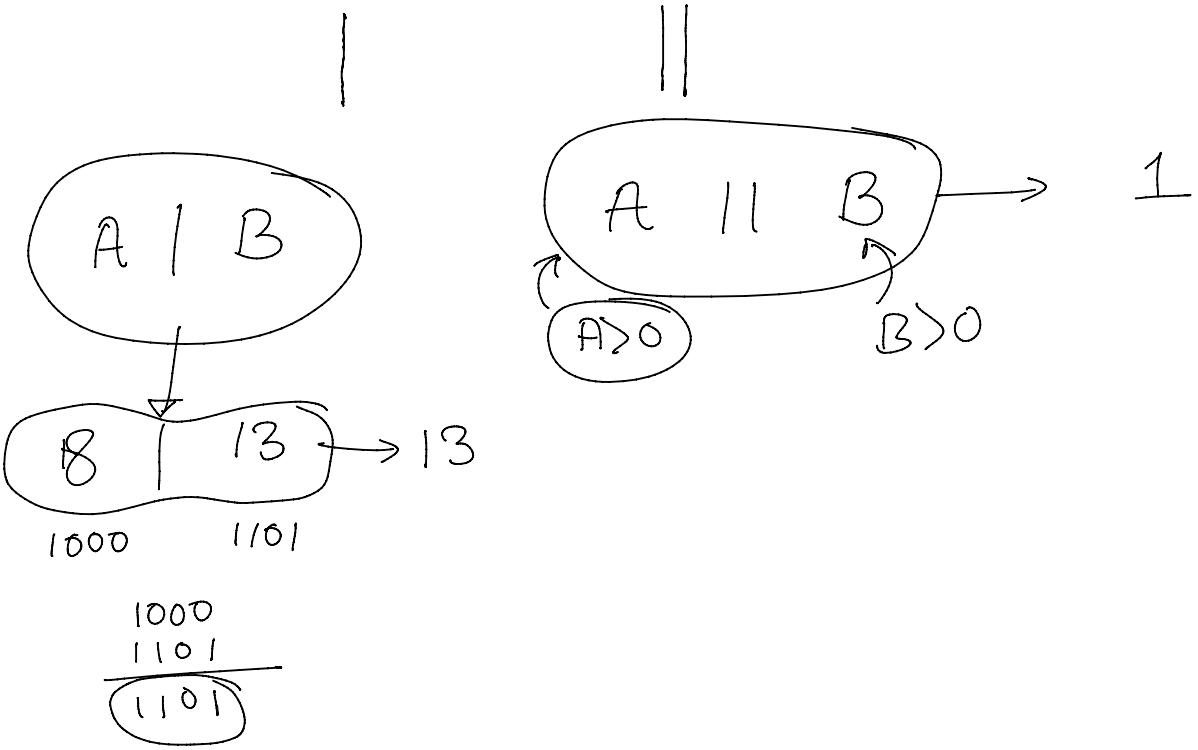
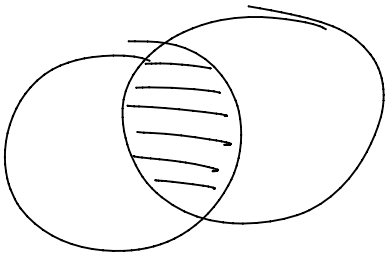
Number



1000
1101
1101

dfs



IEP

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$