EP207

Digital Electronics

What is Electronics?

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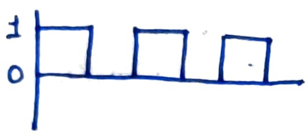
Digital Electronics

⇒ Digital Signal

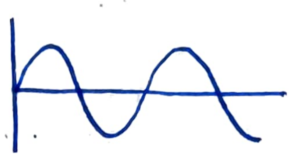
- Not continuous
- Discrete values (finite)



Analog Electronics

⇒ Analog Signal

- Time varying
- Continuous nature

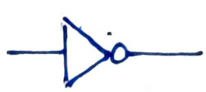


Has two values
- lower value (lower potential)
- higher value (higher potential)

Logic Gates

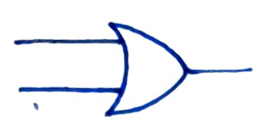
NOT

x	y
0	1
1	0



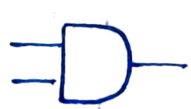
OR

a	b	y
0	0	0
0	1	1
1	0	1
1	1	1



AND

a	b	y
0	0	0
0	1	0
1	0	0
1	1	1

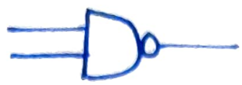


(multiplyer)

(AND)' ⇒ NAND

y'_{AND}

1
1
1
0



(OR)' ⇒ NOR

y'_{OR}

1
0
0
0

Exclusive OR ⇒ XOR

a	b	y
0	0	0
0	1	1
1	0	1
1	1	0

(used for parity checking applications)

- if even 1s ⇒ low
- if odd 1s ⇒ ~~odd~~ high.

Parties (Presence of 1s in any gate)
→ Odd = odd number of 1s
→ Even = even number of 1s

De Morgan's Theoram

- Logical Fundamentals

$A.0 = 0$ $\quad$ $A+0 = A$

$A.1 = A$ $\quad$ $A+1 = 1$

$A.A = A$ $\quad$ $A+A = A$

$A.\bar{A} = 0$ $\quad$ $A+\bar{A} = 1$

- Law of complementation

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

- Commutative Law

$A+B = B+A$

$AB = BA$

- Associative Law

$A+(B+C) = (A+B)+C$

$A(BC) = (AB)C$

Upon Applying These,

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

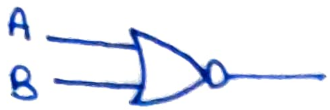
$\Rightarrow \overline{A.B} = \bar{A}+\bar{B}$

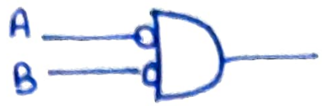
"Complement of Sum is equal to AND of the compliment of the iputs"

...and vice versa

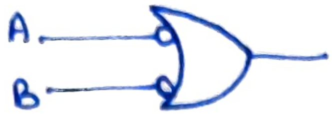
(NOR) $\overline{A+B}$ = $\bar{A}\cdot\bar{B}$ (Bubbled AND)

"to invert a signal place a bubble"





(NAND) $\overline{A\cdot B}$ = $\bar{A}+\bar{B}$ (Bubbled OR)



Examples (Simplification)

- $(A + AB) = A$
- $(A+B)(A+C) = A + BC$
- $((AB)' + A' + AB)' = 0$
- $((AB+C)\overline{(\overline{AC}+BC)+ABC} + \overline{AB})' = A(B+C)$

AOI logic → AND, OR, IVERTOR gates only circuit

NAND-NAND logic → NAND gats only

NOR-NOR logic → NOR gates only