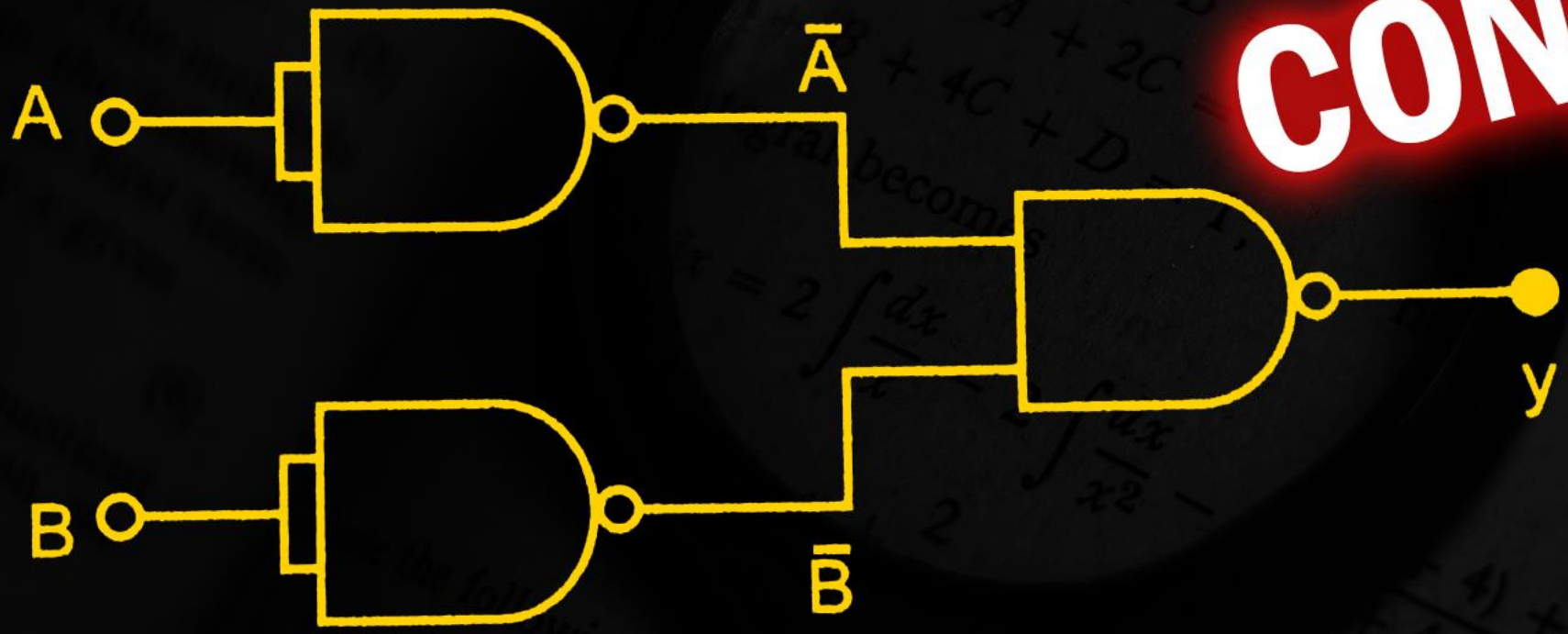
LOGIC GATE

Semiconductor -3

JEE MAIN

CONCEPT
PYQs



by Mohit Goenka, IIT Kharagpur

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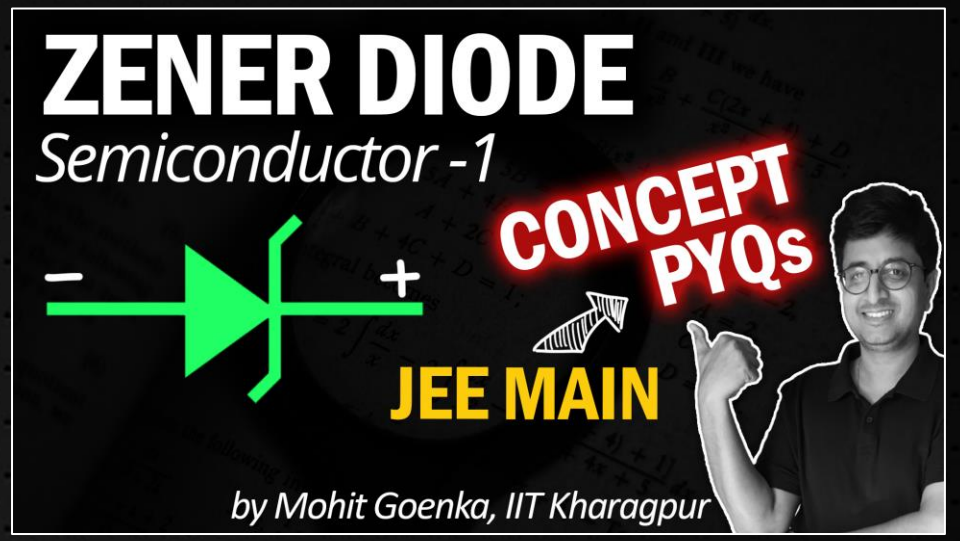
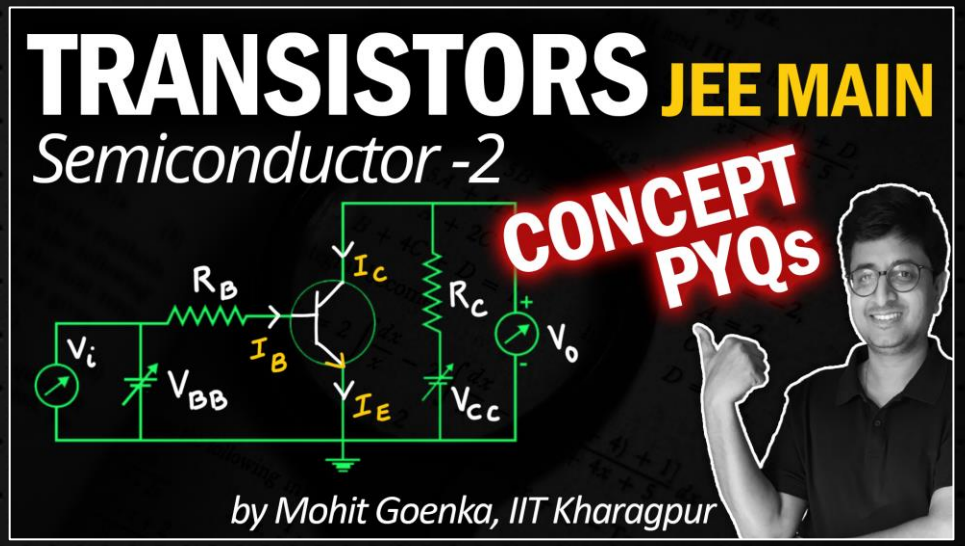




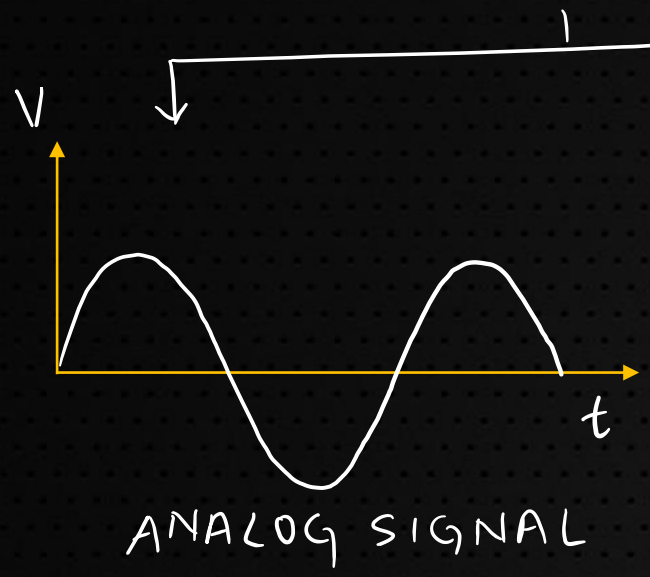
Eduniti for Physics

...MANY MORE

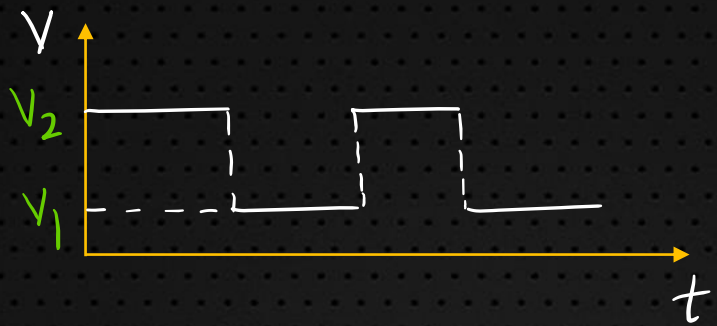
TOPICS COVERED

1. Analog and Digital Signal
2. Logic Gates (Types)
3. NOT Gate
4. AND Gate
5. OR Gate
6. Rules of Boolean Algebra & De Morgan's Theorem
7. NAND Gate
8. NOR Gate
9. Exclusive Gates (XOR & XNOR)
10. PYQs (Build your understanding)

1. ANALOG & DIGITAL SIGNAL



ANALOG SIGNAL



DIGITAL SIGNAL

↳ It has two states

(1.) High → 1

(2.) LOW → 0

Logic gates are integral part of Digital Electronics

2. LOGIC GATES

↳ Electrical cicuits using logical relation between input and output voltages.

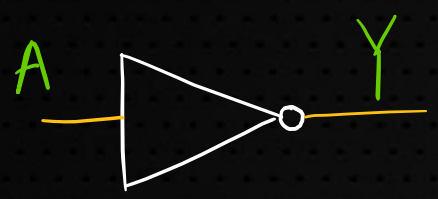
- NOT Gate
- AND Gate
- OR Gate

} BASIC GATES

- NAND Gate
- NOR Gate

} UNIVERSAL GATES

3. NOT GATE (Inversion Gate)



$Y = \bar{A}$

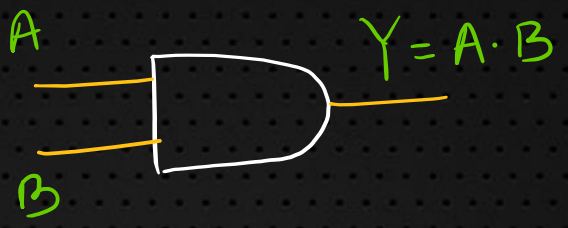
TRUTH TABLE

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

Truth Table : Relation between Input and Output.

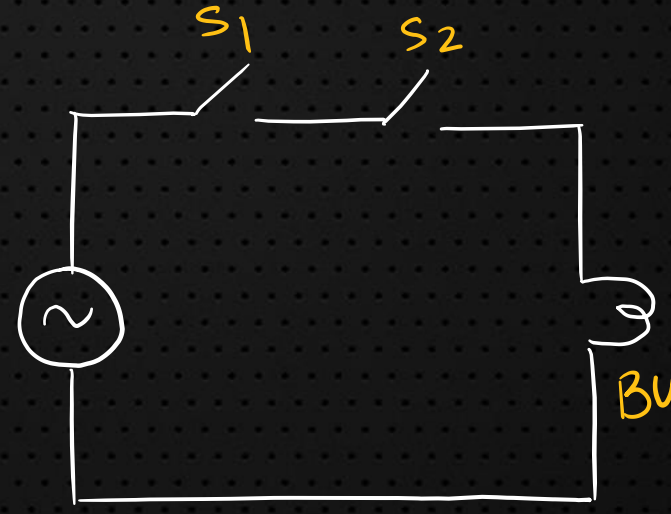
4. AND GATE

↳ output high (1), if both input is high (1)
↳ output low (0), if either input is Low (0)



TRUTH TABLE

A	B	Y = A·B
1	0	0
0	1	0
1	1	1
0	0	0



⇒ switch close : 1
switch open : 0
Bulb Glow = 1
else = 0

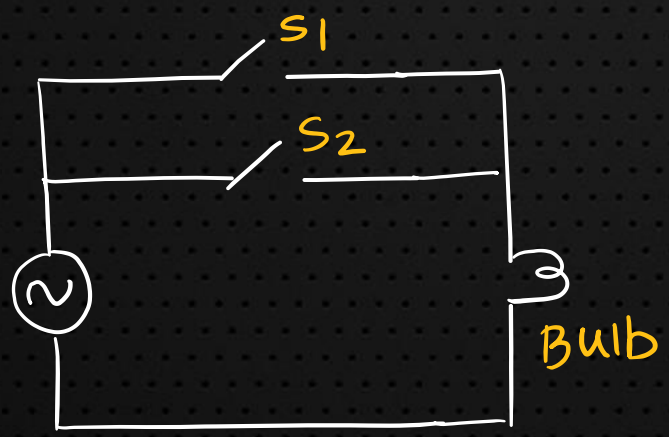
5. OR GATE

↳ Output high (1), if either input is high (1)

↳ Output Low (0), if both input Low (0)

TRUTH TABLE

A	B	Y = A+B
1	0	1
0	1	1
1	1	1
0	0	0



6. RULES OF BOOLEAN ALGEBRA & DE MORGAN'S THEOREM

(a) $A + 0 = A$

(b) $A + A = A$

(c) $A \cdot A = A$

(d) $A \cdot \bar{A} = 0$

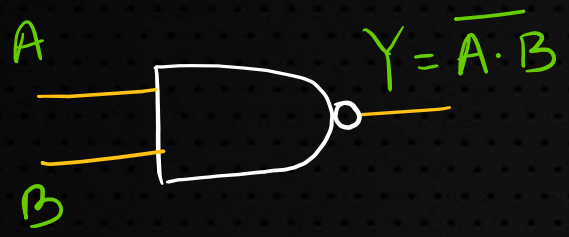
(e) $\bar{\bar{A}} = A$

DE MORGAN'S THEOREM

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

↳ Boolean Expressions

7. NAND GATE (AND + NOT)



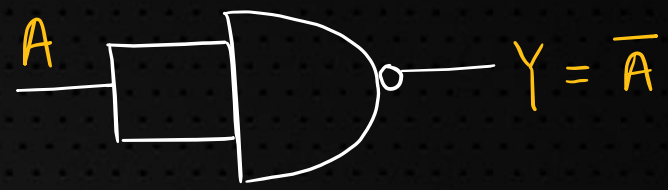
Inverts the AND GATE output.

TRUTH TABLE

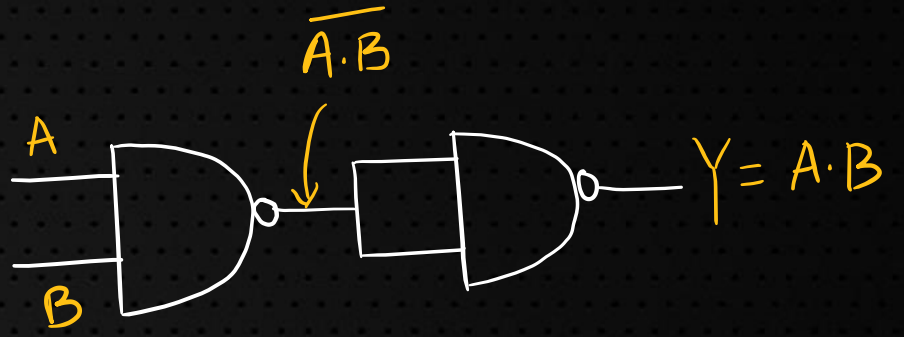
A	B	$Y = \overline{A \cdot B}$
1	0	1
0	1	1
1	1	0
0	0	1

NAND GATE
(UNIVERSAL GATE)

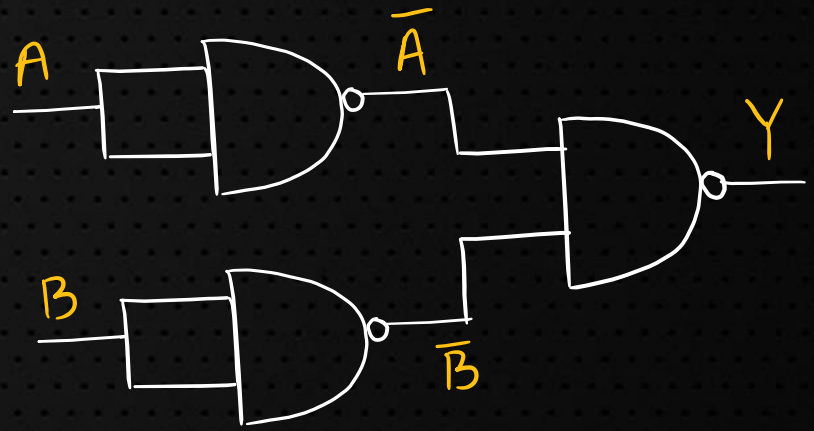
NOT →



AND →

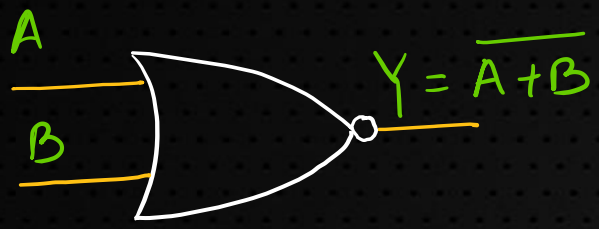


OR →



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

8. NOR GATE (OR + NOT)



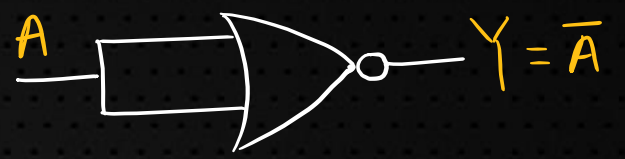
Inverts the AND GATE output.

TRUTH TABLE

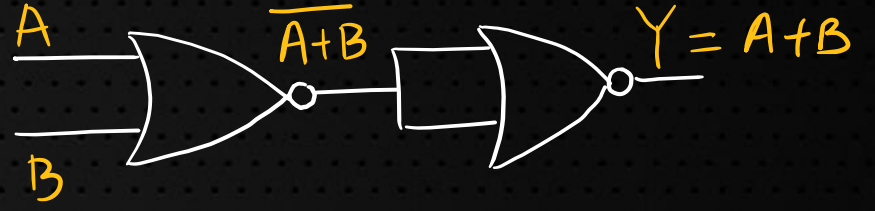
A	B	$Y = \overline{A+B}$
1	0	0
0	1	0
1	1	0
0	0	1

NOR GATE
(UNIVERSAL GATE)

NOT →



OR →



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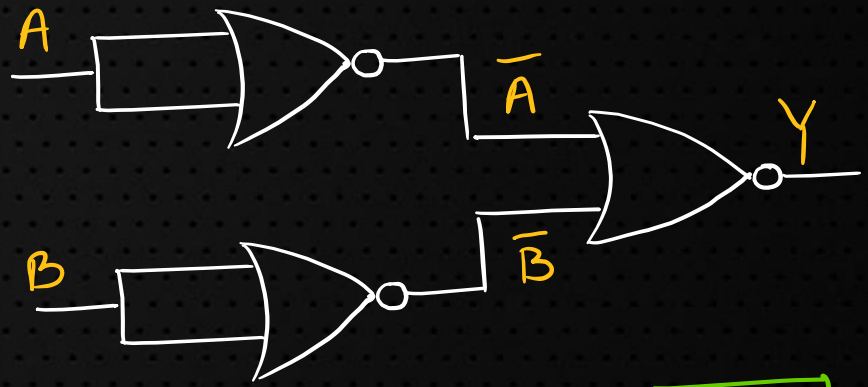
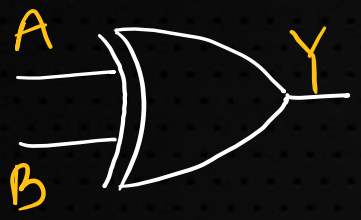


$Y = \overline{\overline{A}+\overline{B}} = \overline{\overline{A}}.\overline{\overline{B}} = \boxed{A.B}$

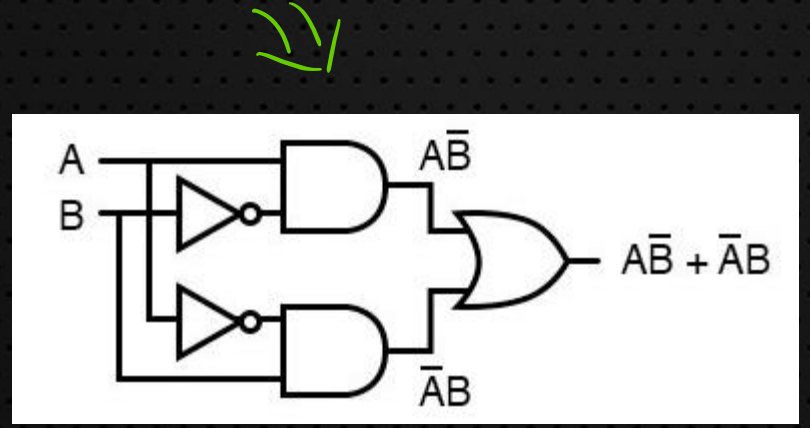
9. EXCLUSIVE GATES



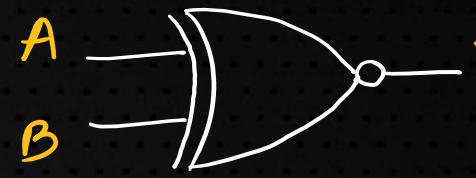
$Y = \bar{A} \cdot B + A \cdot \bar{B}$

XOR (Exclusive OR GATE)

A	B	Y
1	0	1
0	1	1
1	1	0
0	0	0



XNOR (EXCLUSIVE NOR GATE)



$Y = \bar{A} \cdot \bar{B} + AB$

A	B	Y
1	0	0
0	1	0
1	1	1
0	0	1

Link In Video Description Box.