January '16

February

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Wk 01 001-365 Friday 01

Boolean Algebra logic gates

Boolean algebra is a system of mathematical logic and is differs from both ordinary algebra and the binary number system. In boolean algebra $1+1=1$, in it the variables permitted to have only two values true or false. (1 & 0) and the ~~algeb~~ algebraic operations on the ~~va~~ variables are limited to those defined as AND, OR, NOT

Boolean two variables true and false may be represented by on or off states of electronic switching circuits. On account of such functioning of switching circuits, Boolean algebra becomes of practical significance and is implemented through these switching that act as electronic logic circuits.

Logic gates →

A logic gate is an electronic circuit which makes logic decisions. It has one output and one or more inputs. Logic gates are the basic building blocks from which most of the digital systems are built up. They implement the hardware logic function based on the logical algebra called boolean algebra

02 Saturday

January '16

(002-364) The OR Gates → this operation is represented by the symbol + and the operation written as

A OR B = A + B = C

which means that if A is true OR B is true then C will be true.

Truth table for OR operation →

	0	1	2	3
A	0	0	1	1
B	0	1	0	1
C	0	1	1	1

Truth table

A + B = C

0 + 0 = 0

0 + 1 = 1

1 + 0 = 1

1 + 1 = 1

OR function

The electronic symbol for a two input OR gate is shown in fig a and its equivalent switching circuit fig b.

03 Sunday

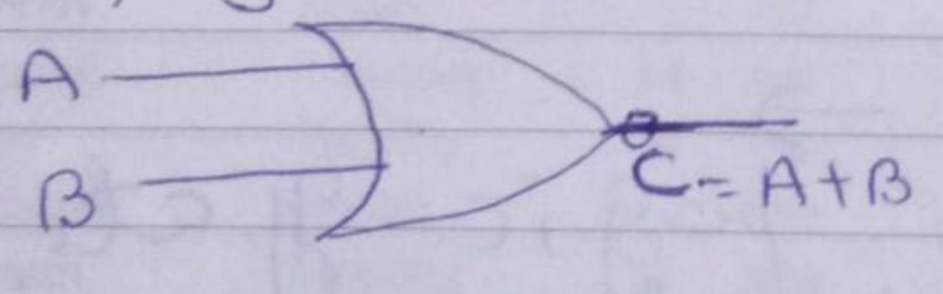


fig a

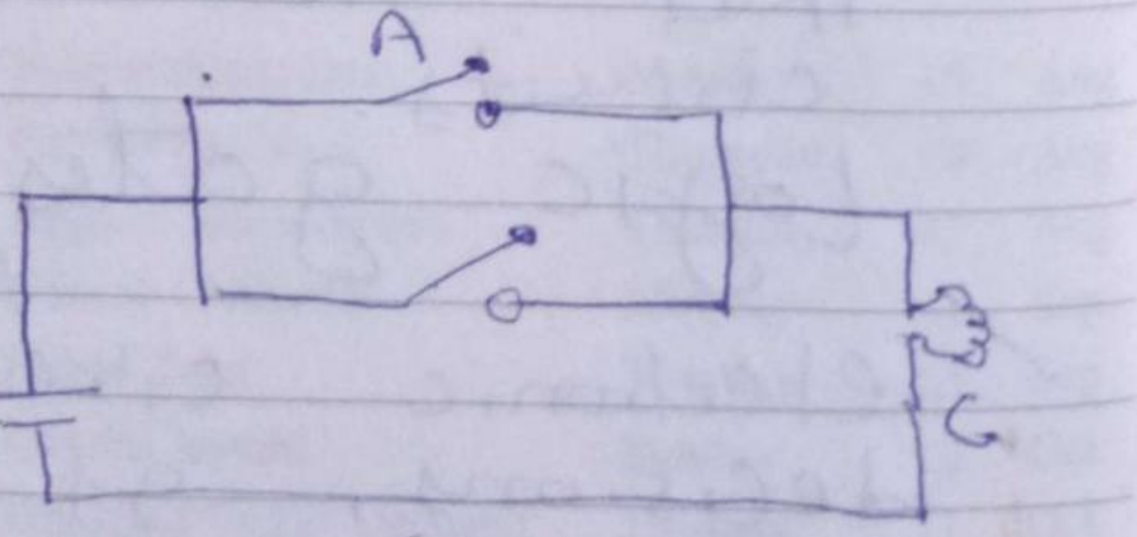


fig b

The two inputs have been marked A and B and the output as C.. in fig (b) if all inputs are at zero level, diodes do not conduct: current through

R_L is zero and output level taken across R_L is zero.

(2) THE AND OPERATION →

This operation is represented by the symbol • and the operation can be written as

$$A \text{ AND } B = A \cdot B = AB = C$$

which means that if A is true AND B is true and C will be true.

Truth table for AND operation

A · B = 0
0 0 = 0
0 1 = 0
1 0 = 0
1 1 = 1

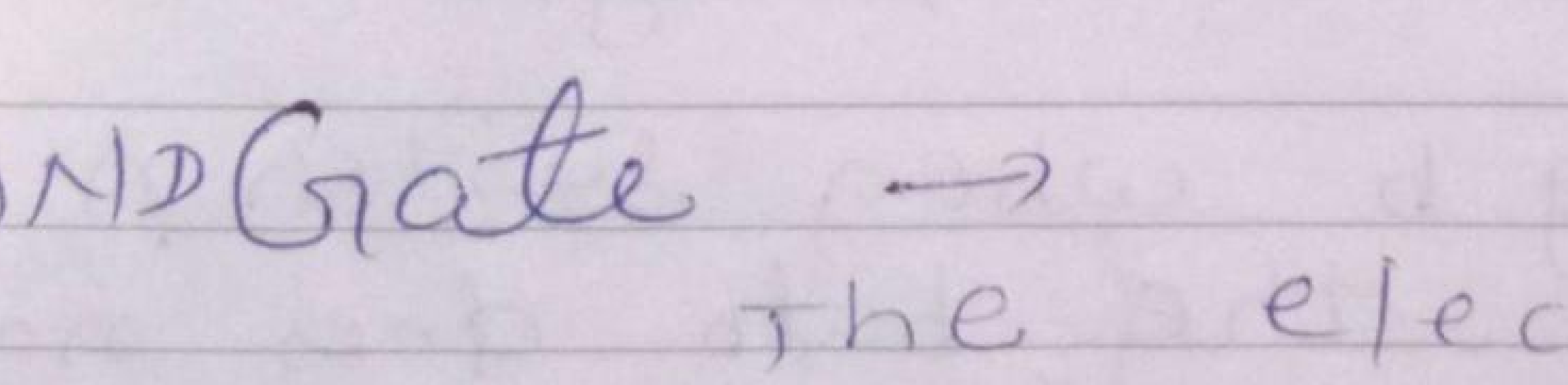
AND function

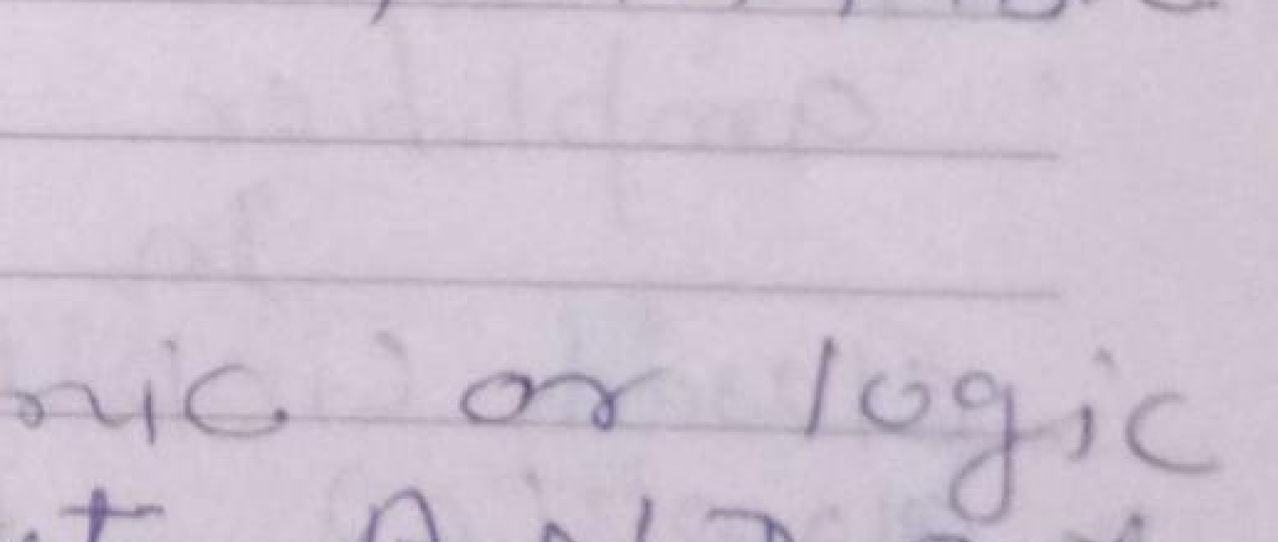
	0	1	2	3
A	0	0	1	1
B	0	1	0	1
C	0	0	0	1

truth table

AND Gate →

The electronic or logic symbol for a 2 input AND gate is shown in fig 2a and its equivalent switching circuit in fig b.





AND operation

The AND gate gives an output only when all its input are present.

(3) The NOT Gate → It is so called because its output is NOT the same as its input. It is also called an inverter because it inverts the input signal. It has one input and one output shown in fig 3a. This operator is represented by a bar e.g. $\bar{A}$. The operation is also called as complementation or negation (inversion). The NOT gate is thus called complementary circuit.

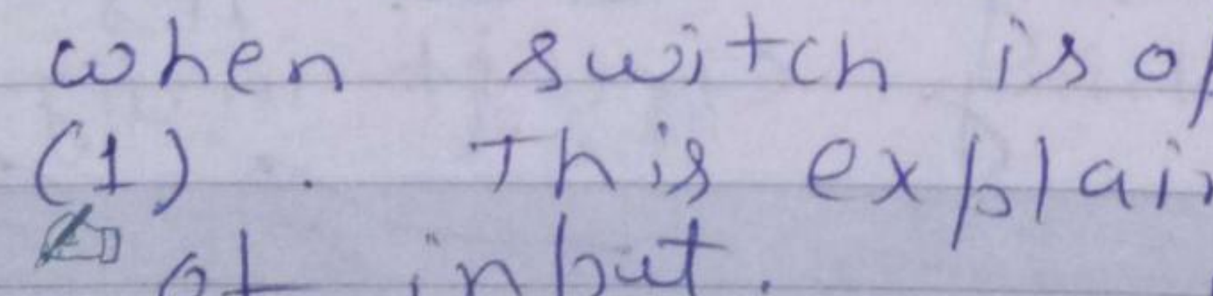


fig a

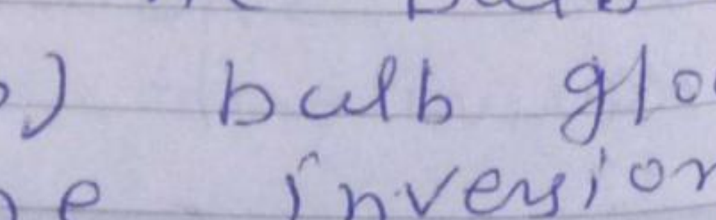


fig b

The symbol of Circle actually represents the inversion and the triangle an amplifier.

In fig b when switch A is closed (input 1) the bulb does not glow (0) because closed switch present a short circuit across the bulb similarly when switch is open (0) bulb glows (1). This explains the inversion of input.

Truth table for operation

$A = \bar{A}$

$0 = 1$

$1 = 0$

A	q
0	1
1	0

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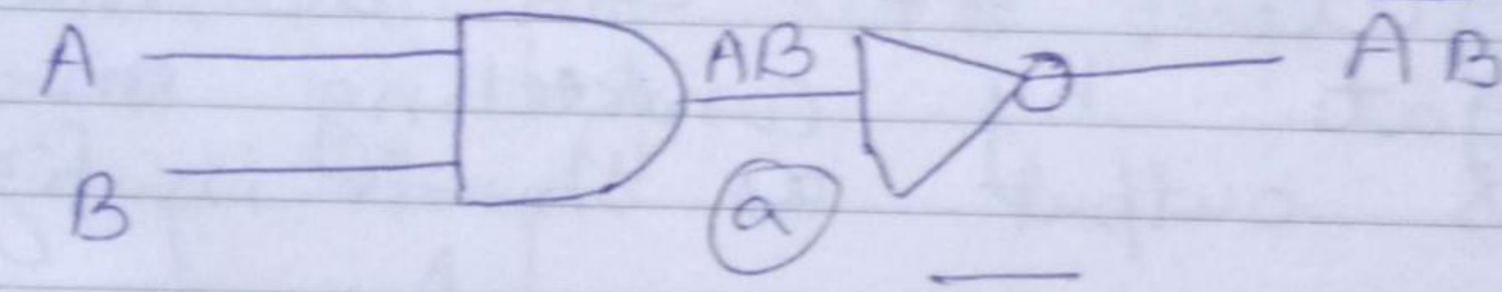
06

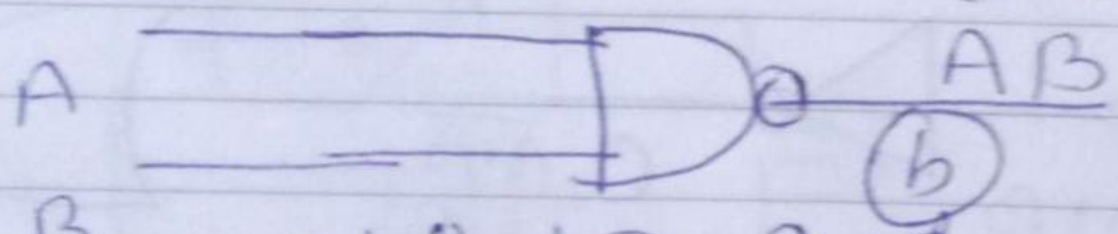
Wednesday

Bubbled gates

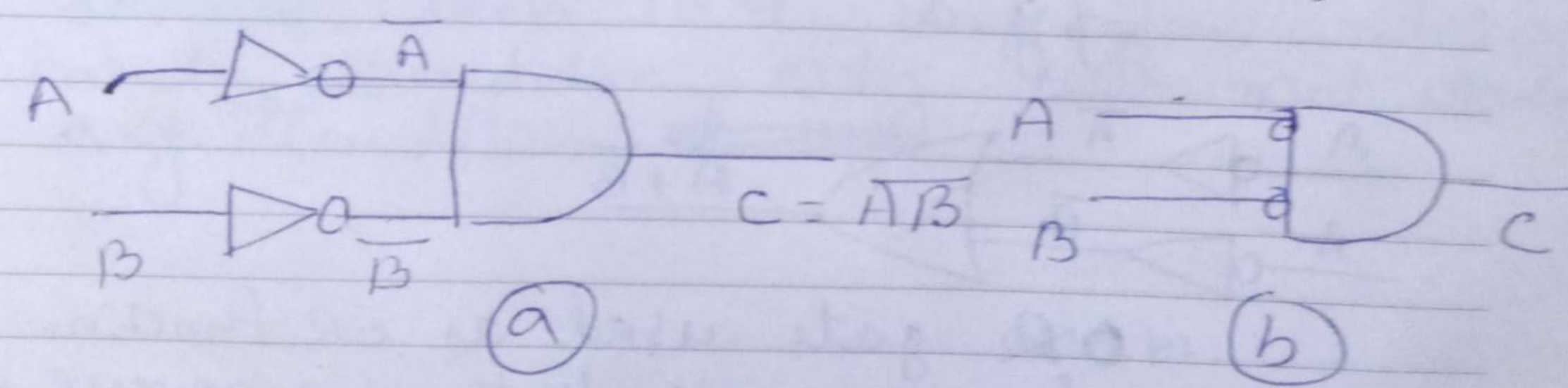
A bubbled gate is one whose inputs are NOTed or inverted ie it is negated gate. NAND & NOR gate can perform both the AND function or OR function. Thus these two gates are called Universal building blocks.

NAND gate → NAND gate symbolically in which a NOT gate follows an AND gate (inverter). The inputs A & B are ANDed, yielding AB and then inverted, $\overline{AB}$





NAND gate used AND function



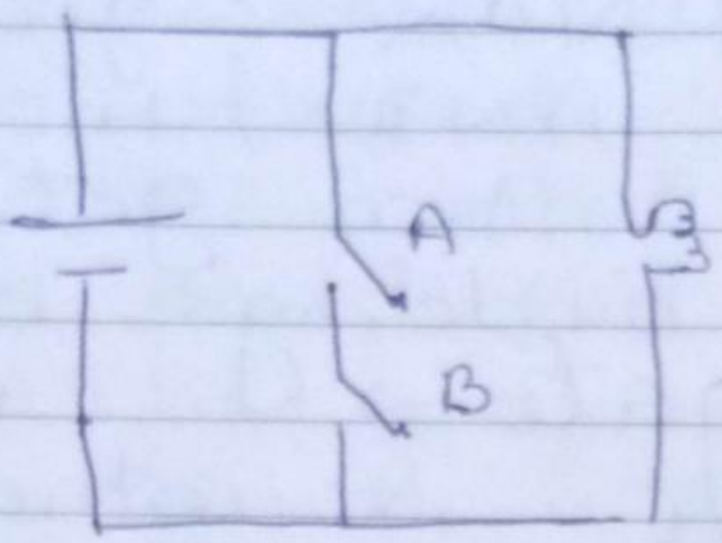
The Truth table →

AND $C = AB = \overline{\overline{AB}}$ NAND

	0	1	2	3
A	0	0	1	1
$\overline{B}$	0	1	0	1
$\overline{AB}$	1	1	1	0

Thursday

fig K shows the electrical analog of this gate obviously the lamp will not glow if both inputs A and B are in logic "1" state ie switches are closed.



electrical analog of NAND

The NOR gate → It is NOT-OR gate. It can be made of an OR gate by connecting an inverter in its output as shown in fig.

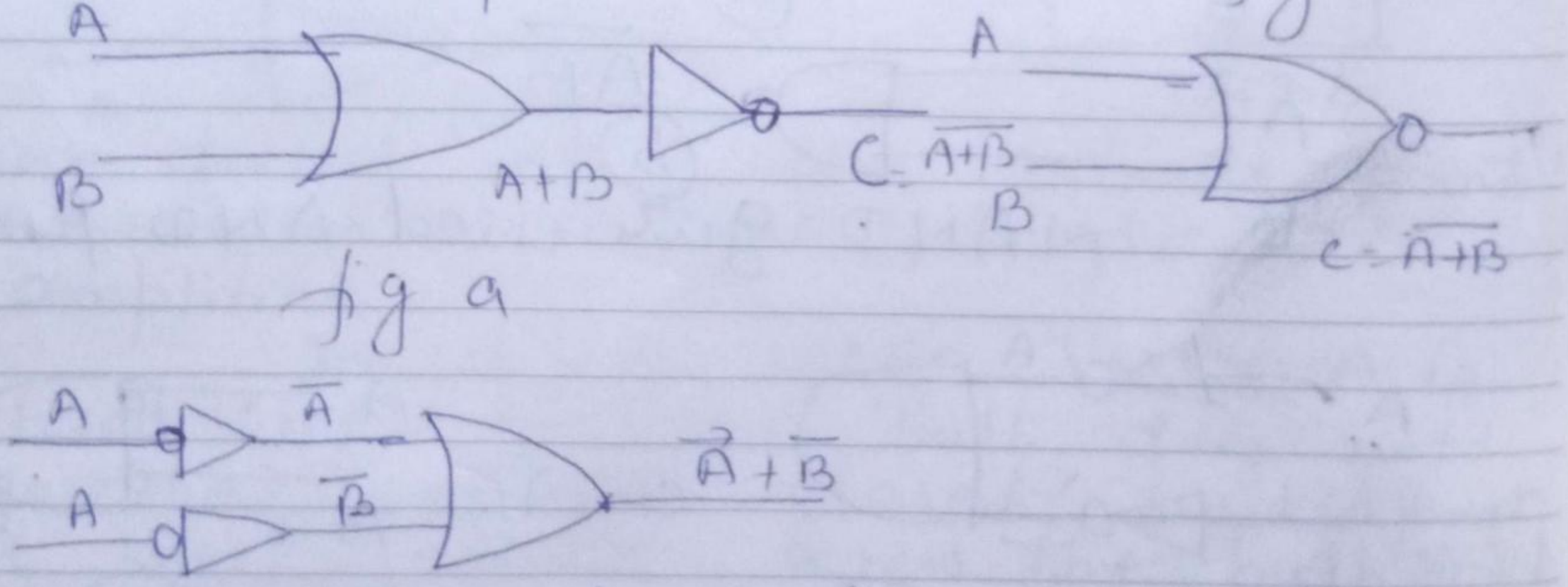


fig a

NOR gate used as OR function

A NOR function is just the reverse of the OR function.

The output equation is just given by

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

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08

Friday

Wk 02 Logic operation 008-358 →

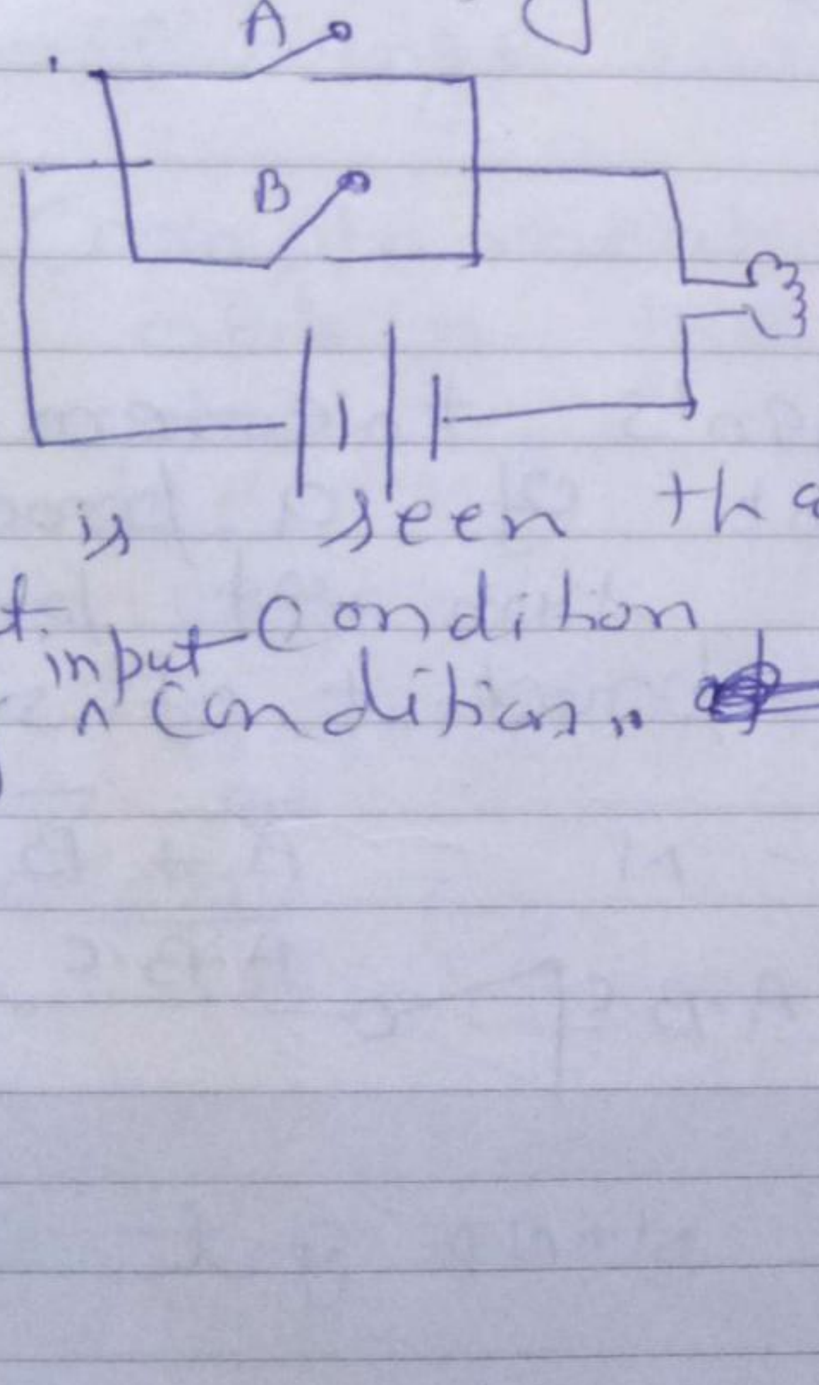
A NOR gate will have an output of 1 only when all its inputs are 0. obviously, if any output is 1, the output will be 0. In a NOR gate, the output if true only when all inputs are false.

Truth table

$C = \overline{A+B}$

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

The equivalent NOR gate function is shown in fig



It is seen that lamp glows under 00 input condition only but not under any input condition.