Mid Term Practical (2021-2022)

- Computer Organisation -

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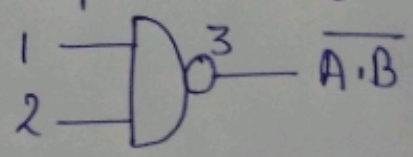
Ans 1 - NAND Gate:- It is a special type of logic gate in the digital logic circuit. It is the universal gate. It means all the basic gates such as AND, OR and NOT gate can be constructed using a nand gate. It is a combination of the NOT-AND gate. The output state of the NAND gate will be low only when all the inputs are high. Simply, this gate returns the complement result of the AND gate.

The logic or Boolean expression for the NAND gate is the complement of logical multiplication of inputs denoted by a full stop or a single dot as.

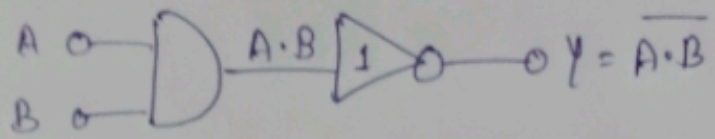
$(A \cdot B)' = Y$



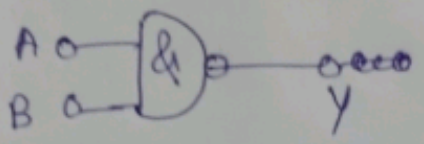
The value of Y will be true when any one of the input is set to 0.

The NAND gate is also classified into three type based on the input it takes.

(i) The 2-input NAND gate



2-input "AND" gate plus a "NOT" gate



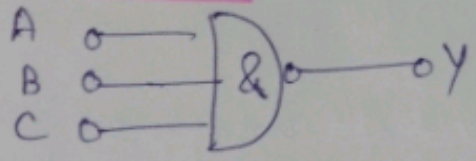
2-Input NAND gate

Truth Table -

Input		output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(ii) The 3-input NAND gate — Unlike the 2-input NAND gate, the 3-input NAND gate has three inputs. There are $2^3 = 8$ possible combinations of inputs.

Logic Design:-



(3-Input NAND gate)

Truth Table:-

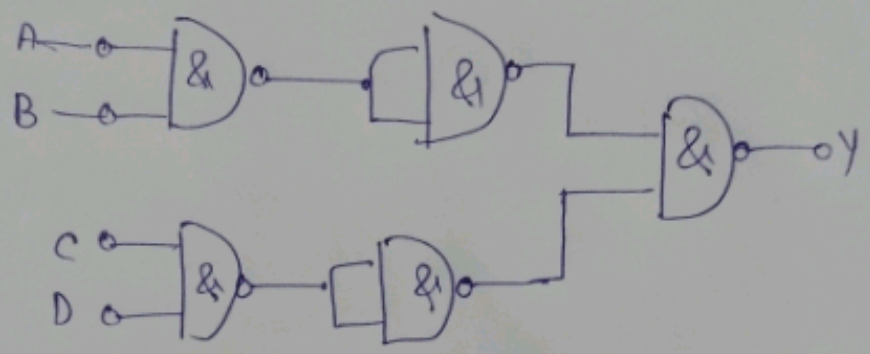
Input			Output
A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

iii) The Multi-input NAND gate:- Just like AND, NOT and OR gate, we can also form n-input NAND gate. If the no. of inputs required is odd, any "unused" input can be held high by directly connecting it to the power supply using high "suitable" pull-up resistor. 4-Input NAND gate following expression:—

$Y = ((A \cdot B)) \cdot (C \cdot D))'$

Y = A NAND B NAND C NAND D

Logic Design:—



Truth Table.

Input						Output
A	B	C	D	E	F	Y
0	0	0	0	0	0	1
0	0	0	0	0	1	1
0	0	0	0	1	0	1
0	0	0	0	1	1	1
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
1	1	1	1	0	0	1
1	1	1	1	0	1	1
1	1	1	1	1	0	1
1	1	1	1	1	1	0