SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

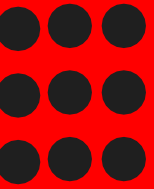## COURSE NAME : 19EE101-BASIC ELECTRICAL & ELECTRONICS ENGINEERING

I YEAR /I SEMESTER

Unit 5: Linear and Digital Electronics
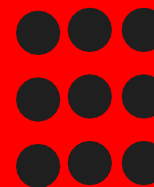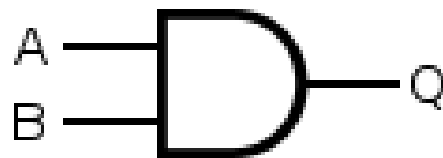
Topic : Half Adder

GRADUATE ATTRIBUTES

INTRODUCTION TO LOGIC GATES

A logic gate is an idealized model of computation or physical electronic device implementing a Boolean function, a logical operation performed on one or more binary inputs that produces a single binary output.

TYPES OF LOGIC GATE

Six types of gates

- NOT
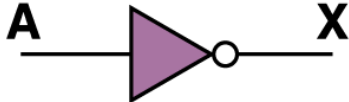
- AND

- OR

- XOR

- NAND

- NOR

Typically, logic diagrams are black and white with gates distinguished only
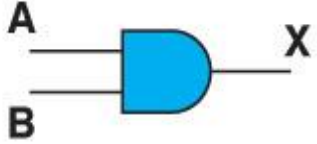
by their shape

NOT GATE

A NOT gate accepts one input signal (0 or 1) and returns the opposite signal as output

Boolean Expression	Logic Diagram Symbol	Truth Table
$X = A'$	A ▷○— X	

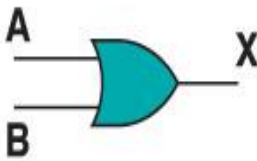| A	X
0	1
1	0

AND GATE

An AND gate accepts two input signals If both are 1, the output is 1; otherwise, the output is 0

Boolean Expression	Logic Diagram Symbol	Truth Table		
$X = A \cdot B$	A, B → X	A	B	X
		0	0	0
		0	1	0
		1	0	0
		1	1	1

OR GATE

An OR gate accepts two input signals If both are 0, the output is 0; otherwise, the output is 1
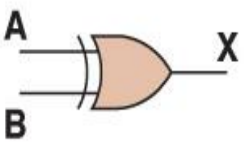
XOR GATE

An XOR gate accepts two input signals If both are the same, the output is 0;

Otherwise, the output is 1

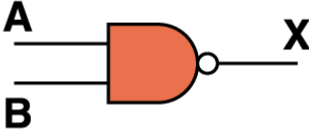| Boolean Expression	Logic Diagram Symbol	Truth Table		
		A	B	X
$X = A \oplus B$		0	0	0
		0	1	1
		1	0	1
		1	1	0

NAND GATE

The NAND gate accepts two input signals If both are 1, the output is

0; otherwise,the output is 1

Boolean Expression	Logic Diagram Symbol	Truth Table

Boolean Expression

X = (A · B)'

Logic Diagram Symbol

A
X
B

Truth Table

A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

NOR GATE

The NOR gate accepts two input signals If both are 0, the output is 1;
 otherwise, the output is 0

SAMPLE COMBINATIONAL CIRCUIT

Consider the following Boolean expression A(B + C)
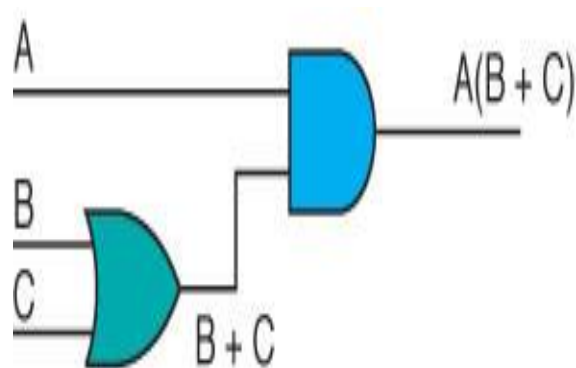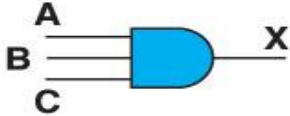
A	B	C	B + C	A(B + C)
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

GATES WITH MORE INPUTS

Gates can be designed to accept three or more input values

A three-input AND gate, for example, produces an output of 1 only if all input values are 1

Boolean Expression	Logic Diagram Symbol	Truth Table			
$X = A \cdot B \cdot C$		**A**	**B**	**C**	**X**
		0	0	0	0
		0	0	1	0
		0	1	0	0
		0	1	1	0
		1	0	0	0
		1	0	1	0
		1	1	0	0
		1	1	1	1

APPLICATION-HALF ADDER

The result of adding two binary digits could produce a carry value
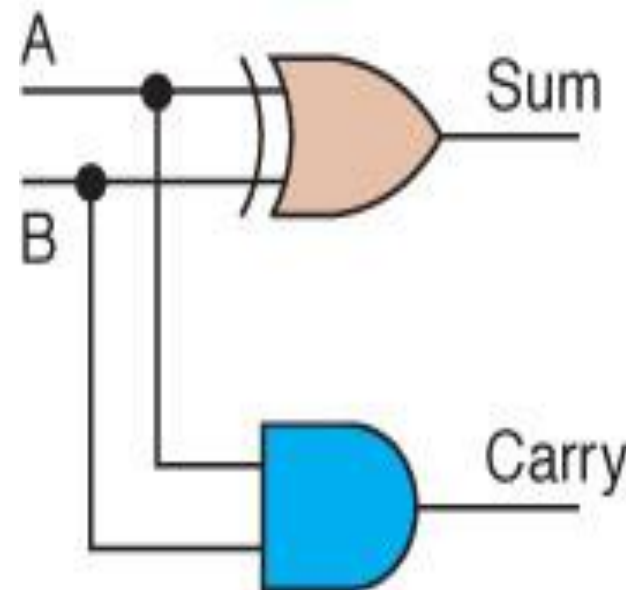
Recall that 1 + 1 = 10 in base two

Half adder

A circuit that computes the sum of two bits and produces the correct carry bit

Circuit diagram representing a half adder

Boolean expressions

sum = $A \oplus B$
carry = AB

A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

REFERENCES

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2. Bhattacharya. S.K, "Basic Electrical and Electronics Engineering", Pearson Education , (2017) – UNIT I – IV

3. Mehta V K, Mehta Rohit, "Principles of Electrical Engineering and Electronics", S.Chand & Company Ltd, (2010)- UNIT I and II

4. Mehta V K, Mehta Rohit, "Principles of Electronics", S.Chand & Company Ltd, (2005)- UNIT IV and V

THANK YOU