SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE101-BASIC ELECTRICAL & ELECTRONICS ENGINEERING

I YEAR /I SEMESTER CSE & CST

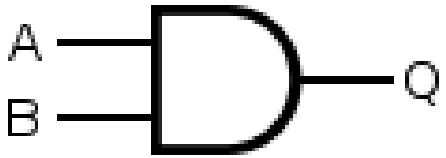
Unit 5: Linear and Digital Electronics

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

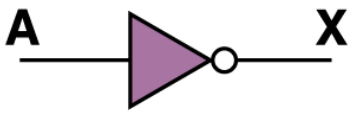
NOT GATE

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

Boolean Expression

$X = A'$

Logic Diagram Symbol



Truth Table

A	X
0	1
1	0

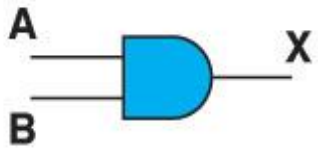
AND GATE

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

Boolean Expression

$$X = A \cdot B$$

Logic Diagram Symbol



Truth Table

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

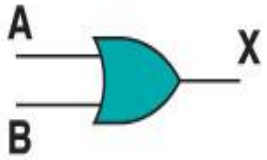
OR GATE

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

Boolean Expression

$X = A + B$

Logic Diagram Symbol



Truth Table

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

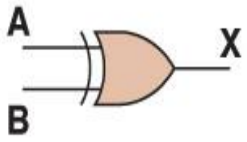
XOR GATE

An XOR gate accepts two input signals If both are the same, the output is 0; Otherwise, the output is 1

Boolean Expression

$X = A \oplus B$

Logic Diagram Symbol



Truth Table

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

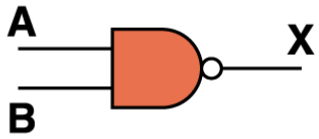
NAND GATE

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

Boolean Expression

$X = (A \cdot B)'$

Logic Diagram Symbol



Truth Table

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

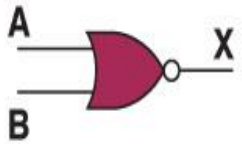
NOR GATE

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

Boolean Expression

$X = (A + B)'$

Logic Diagram Symbol

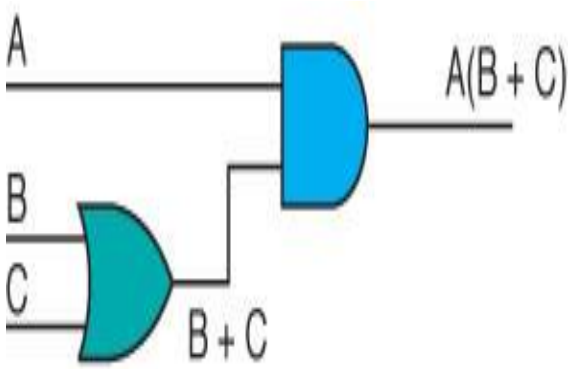


Truth Table

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

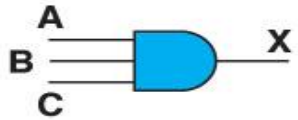
Gates can be designed to accept three or more input values

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

Boolean Expression

$X = A \cdot B \cdot C$

Logic Diagram Symbol



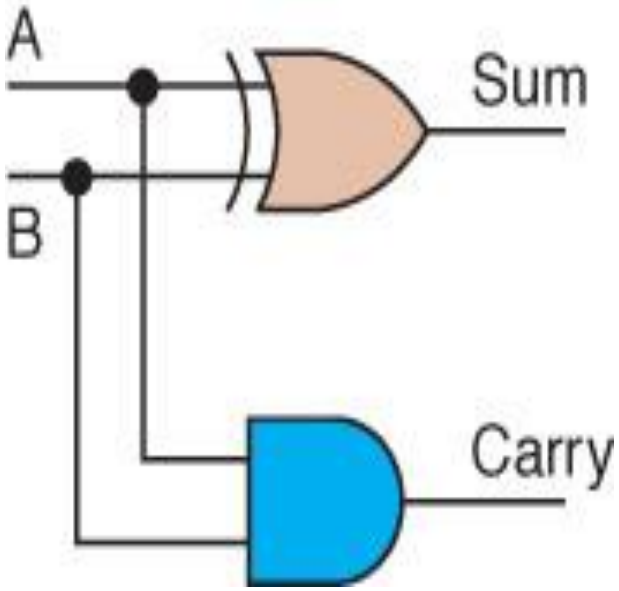
Truth Table

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

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

Circuit diagram representing a half adder

Boolean expressions

sum = $A \oplus B$
carry = AB

REFERENCES

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THANK YOU