SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

23ECB201 – DIGIT AL SYSTEMS DESIGN

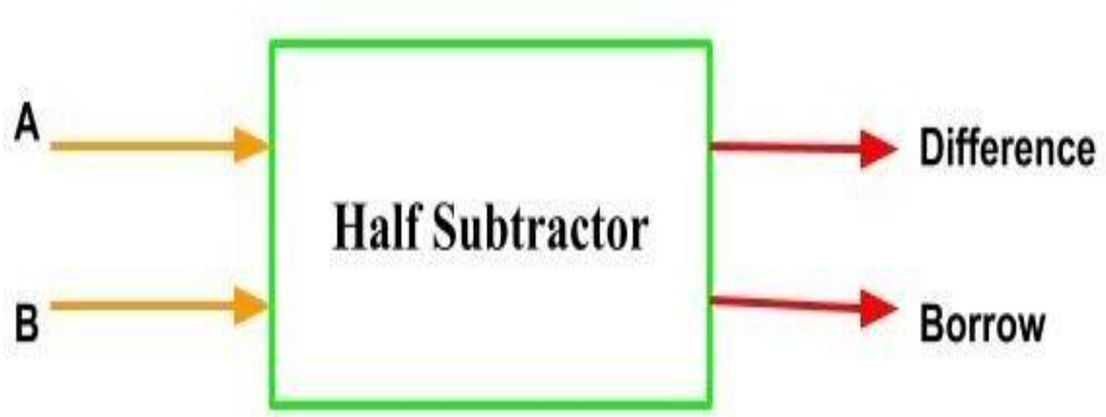
II YEAR/ III SEMESTER

UNIT 2 – COMBINATIONAL CIRCUITS

TOPIC- HALF SUBTRACTOR

HALF SUBTRACTOR

- A half subtractor is a digital logic circuit that performs binary subtraction of two single-bit binary numbers.
- It has two inputs, A and B, and two outputs, DIFFERENCE and BORROW.
- A is called a **Minuend bit** and B is called a **Subtrahend bit.**



TRUTH TABLE

Inputs		Outputs	
A	B	Difference	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Binary Subtraction

0 – 0 = 0

0 – 1 = 1 with 1 borrow

1 – 0 = 1

1 – 1 = 0

LOGICAL EXPRESSION

FOR DIFFERENCE

A \ B	0	1
0	0	1
1	1	0

$$\text{Difference} = A\overline{B} + \overline{A}B = A \oplus B$$

FOR BORROW

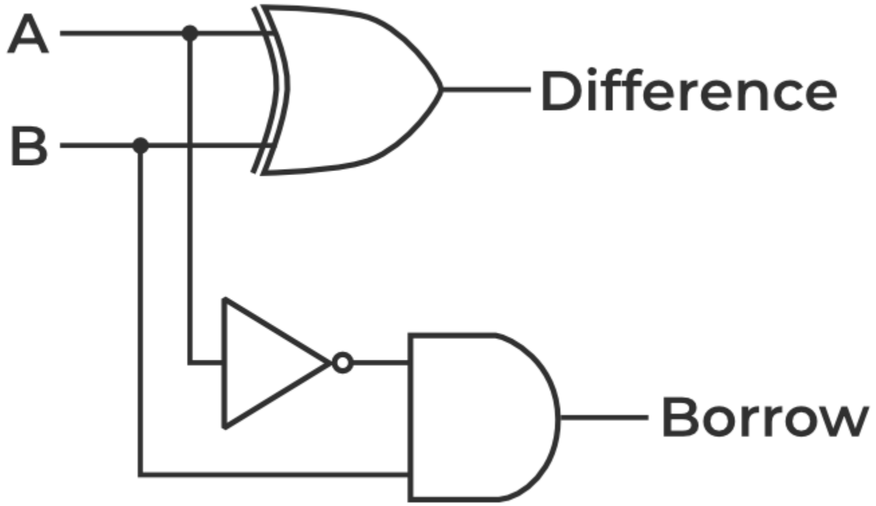
A \ B	0	1
0	0	1
1	0	0

$$\text{Borrow} = \overline{A}B$$

IMPLEMENTATION

Diff= A'B+AB'

Borrow = A'B



APPLICATIONS OF HALF SUBTRACTOR

1. Calculators
2. Alarm Frameworks
3. Automotive Frameworks
4. Security Frameworks
5. Computer Frameworks

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Simplicity
- Building blocks
- Low cost
- Easy integration

DISADVANTAGES

- Limited functionality
- Inefficient for multi-bit numbers
- High propagation delay

ASSESSMENT QUESTIONS

1.For subtracting 1 from 0, we use to take a _____ from neighbouring bits.
a) Carry
b) Borrow
c) Input
d) Output

2. Let the input of a subtractor is A and B then what the output will be if A = B?
a) 0
b) 1
c) A
d) B

3. What does minuend and subtrahend denotes in a subtractor?
a) Their corresponding bits of input
b) Its outputs
c) Its inputs
d) Borrow bits

THANK YOU