

# ***LAB 5***

## **ADDER AND SUBTRACTOR**

### **OBJECTIVES**

After completing this experiment, you will be able to:

- Design and construct half adder, full adder, half subtractor and full subtractor circuits
- Verify their truth tables using logic gates

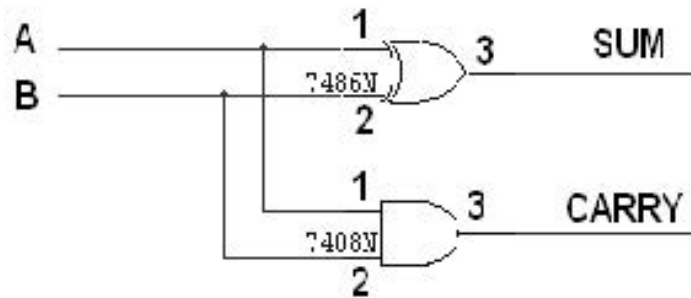
### **COMPONENTS REQUIRED**

- 7430 or 7408 quad 2-input AND gates
- 7432 quad 2-input OR gates
- 7404 hex inverters
- 7486 quad 2-input XOR gates
- 520  $\Omega$  / 1k  $\Omega$  resistors
- DIP Switch
- LEDs

### **THEORY**

A digital adder circuit adds binary signals & a subtractor subtracts binary signals. Half Adder/Subtractor is a basic circuit that adds / subtracts 2 bits and generates Sum or Difference along with Carry / Borrow. Unlike Half Adder or Subtractor a Full Adder / Subtractor has the provision to take consideration of previous Carry / Borrow also.

## LOGIC DIAGRAM HALF ADDER

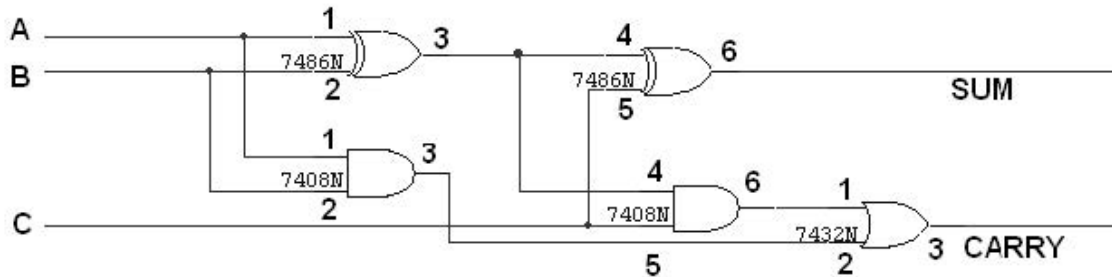


## TRUTH TABLE

A	B	CARRY	SUM
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

## LOGIC DIAGRAM FULL ADDER

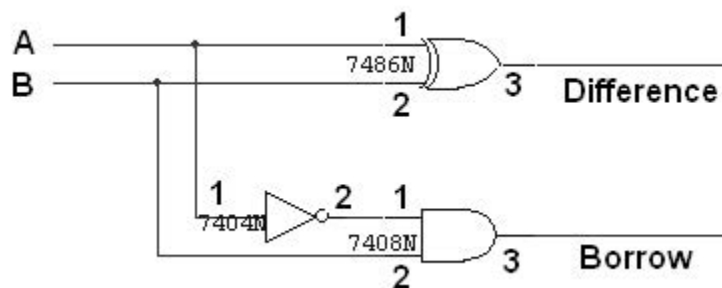
### FULL ADDER USING TWO HALF ADDER



## TRUTH TABLE

A	B	C	CARRY	SUM
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

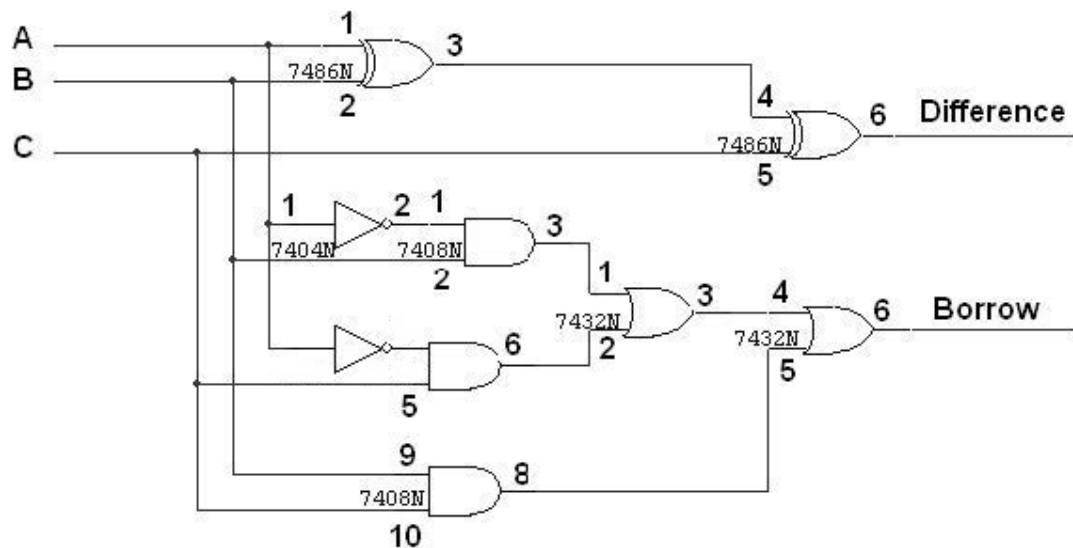
## LOGIC DIAGRAM HALF SUBTRACTOR



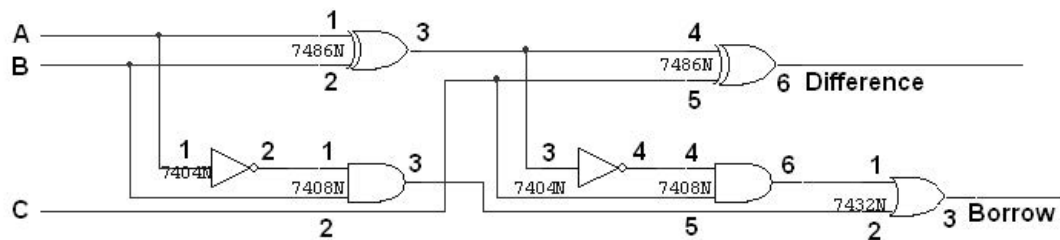
## TRUTH TABLE

A	B	BORROW	DIFFERENCE
0	0	0	0
0	1	1	1
1	0	0	1
1	1	0	0

## LOGIC DIAGRAM FULL SUBTRACTOR



## FULL SUBTRACTOR USING TWO HALF SUBTRACTOR



## TRUTH TABLE

A	B	C	BORROW	DIFFERENCE
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

## PROCEDURE

- Connections are given as per circuit diagram.
- Logical inputs are given as per circuit diagram.
- Observe the output and verify the truth table.