



# Walchand College of Engineering, Sangli

(An Autonomous Institute)

## DESIGN OF 4-BIT ADDER AND SUBTRACTOR

EXPT NO:

DATE :

**AIM:** To design and implement 4-bit adder and subtractor using IC 7483.

### APPARATUS REQUIRED:

Sl.No.	COMPONENT	SPECIFICATION	QTY.
1.	IC	IC 7483	1
2.	EX-OR GATE	IC 7486	1
3.	NOT GATE	IC 7404	1
3.	IC TRAINER KIT	-	1
4.	PATCH CORDS	-	30

### THEORY:

#### 4 BIT BINARY ADDER:

A binary adder is a digital circuit that produces the arithmetic sum of two binary numbers. It can be constructed with full adders connected in cascade, with the output carry from each full adder connected to the input carry of next full adder in chain. The augends bits of 'A' and the addend bits of 'B' are designated by subscript numbers from right to left, with subscript 0 denoting the least significant bits. The carries are connected in chain through the full adder. The input carry to the adder is  $C_0$  and it ripples through the full adder to the output carry  $C_4$ .

#### 4 BIT BINARY SUBTRACTOR:

The circuit for subtracting  $A-B$  consists of an adder with inverters, placed between each data input 'B' and the corresponding input of the full adder. The input carry  $C_0$  must be equal to 1 when performing subtraction.



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## 4 BIT BINARY ADDER/SUBTRACTOR:

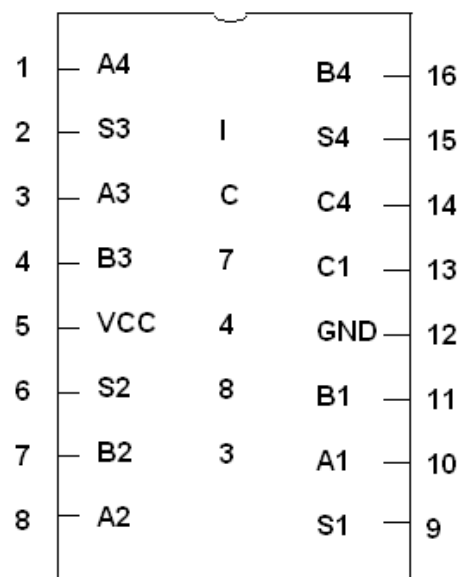
The addition and subtraction operation can be combined into one circuit with one common binary adder. The mode input M controls the operation. When M=0, the circuit is adder circuit. When M=1, it becomes subtractor.

## 4 BIT BCD ADDER:

Consider the arithmetic addition of two decimal digits in BCD, together with an input carry from a previous stage. Since each input digit does not exceed 9, the output sum cannot be greater than 19, the 1 in the sum being an input carry. The output of two decimal digits must be represented in BCD and should appear in the form listed in the columns.

ABCD adder that adds 2 BCD digits and produces a sum digit in BCD. The 2 decimal digits, together with the input carry, are first added in the top 4-bit adder to produce the binary sum.

## PIN DIAGRAM FOR IC 7483:



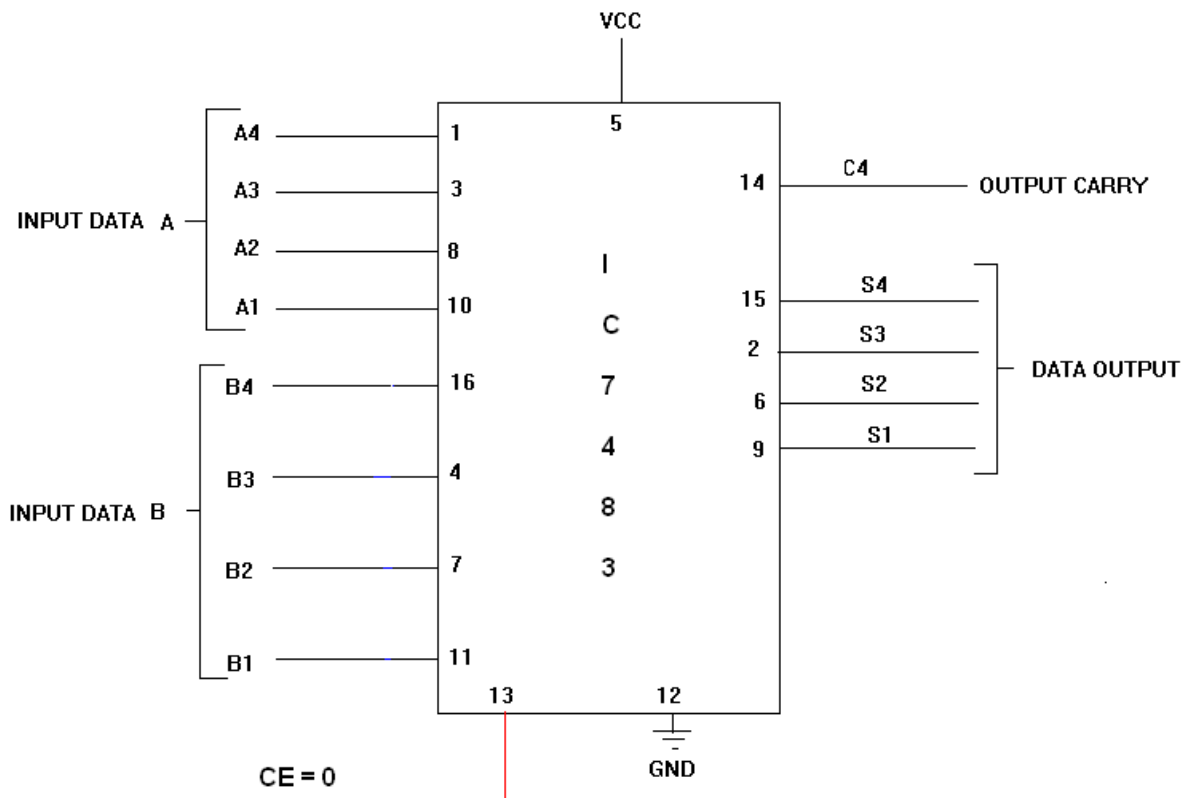


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## LOGIC DIAGRAM:

### 4-BIT BINARY ADDER



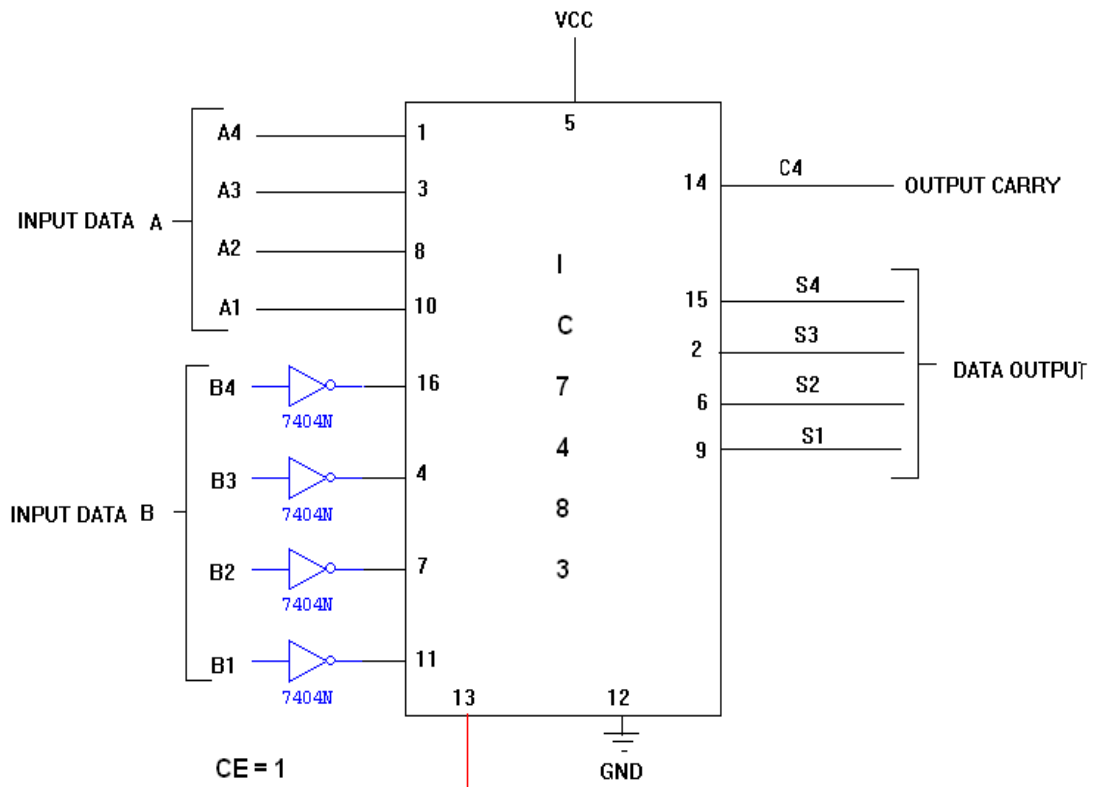


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## LOGIC DIAGRAM:

### 4-BIT BINARY SUBTRACTOR



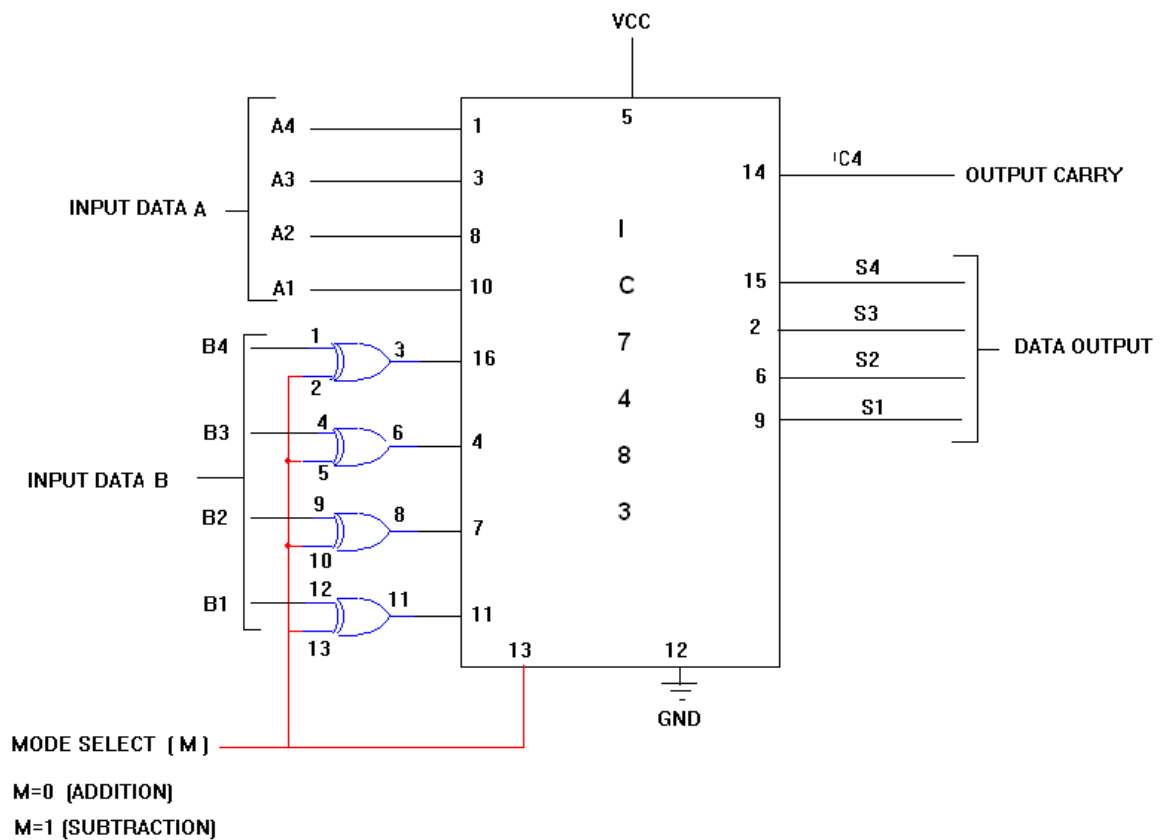


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## LOGIC DIAGRAM:

### 4-BIT BINARY ADDER/SUBTRACTOR





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## TRUTH TABLE:

Input Data A				Input Data B				Addition					Subtraction				
A4	A3	A2	A1	B4	B3	B2	B1	C	S4	S3	S2	S1	B	D4	D3	D2	D1
1	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	1	0
1	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0
0	0	1	0	1	0	0	0	0	1	0	1	0	0	1	0	1	0
0	0	0	1	0	1	1	1	0	1	0	0	0	0	1	0	1	0
1	0	1	0	1	0	1	1	1	0	0	1	0	0	1	1	1	1
1	1	1	0	1	1	1	1	1	1	0	1	0	0	1	1	1	1
1	0	1	0	1	1	0	1	1	0	1	1	1	0	1	1	0	1

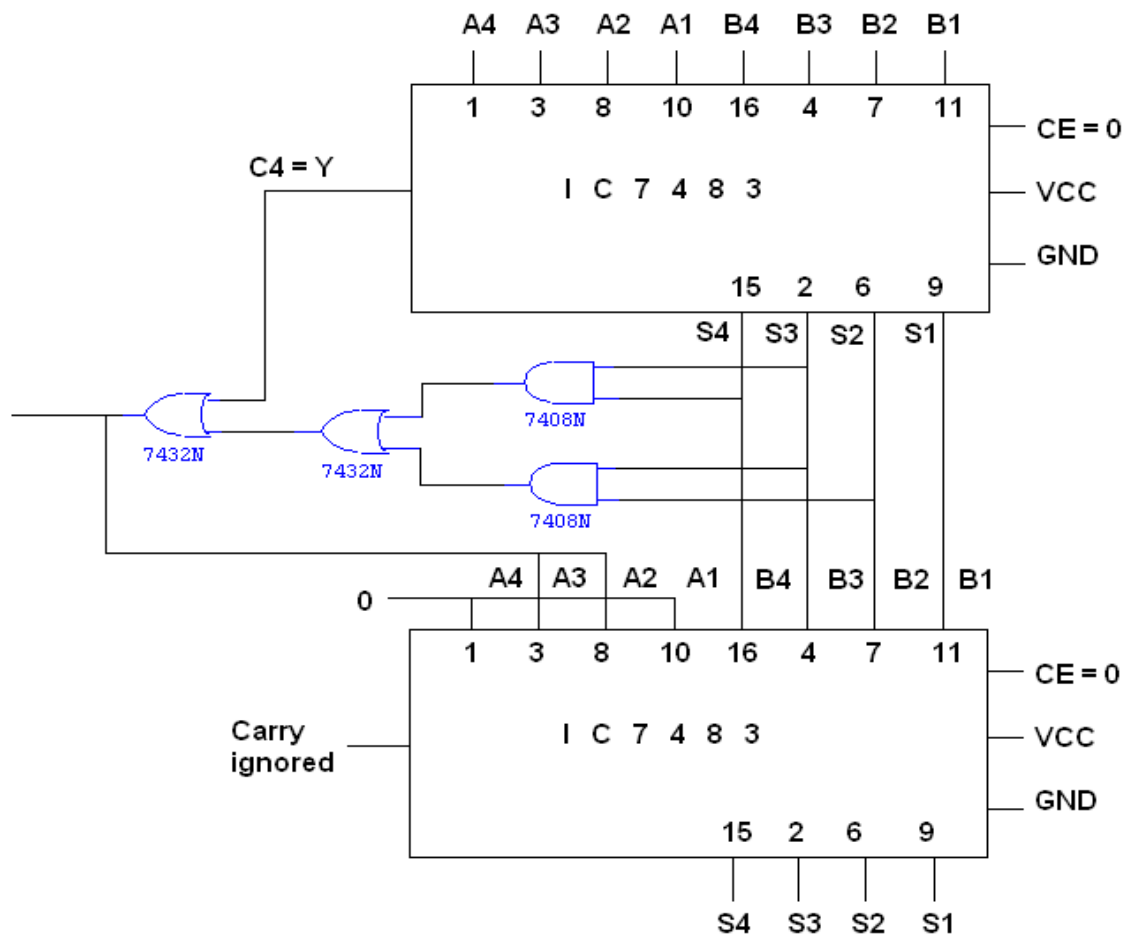


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## LOGIC DIAGRAM:

### BCD ADDER





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## TRUTH TABLE:

BCD SUM				CARRY
S4	S3	S2	S1	C
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

## K MAP:

		S1 S2			
		00	01	11	10
S3 S4	00	0	0	0	0
	01	0	0	0	0
	11	1	1	1	1
	10	0	0	1	1

$$Y = S4 (S3 + S2)$$





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### **PROCEDURE:**

- (i) Connections were given as per circuit diagram.
- (ii) Logical inputs were given as per truth table
- (iii) Observe the logical output and verify with the truth tables.

### **RESULT:**