EXPERIMENT 3 : Adder / Subtractor

OBJECTIVES

- To practice on signed / unsigned representation of binary numbers.
- To perform addition and subtraction by using 4-bit binary adder.

APPARATUS

7483 4-bit binary adder

7486 quad 2-input XOR gates

Connection wires or Jumper wires

Wire Stripper / CutterConnection wires or Jumper wires, Wire Stripper / Cutter

PRELIMINARY WORK

1. Fill the table with the 1's and 2's complements of the given binary numbers.

	1s complement	2s complement
1011		
1111		
0101		
0000		
0011		

2. Fill the table with the 8-bit signed representations of the decimal numbers. (See pp.216-218 in the course textbook)

Decimal	Signed Magnitude	Signed 1's complement	Signed 2's complement
-55			
-23			
-15			
-4			
-105			

- **3.** The 4 bit adder/subtractor circuit implemented with IC 7483 is shown in Figure 1. Explain the operation of the circuit with your own words, briefly.
- **4.** What is the difference between "*half adder*", "*full adder*", "*ripple carry adder*" and "*carry look ahead adder*" circuits? Explain with your own words, briefly.



M = 0 for add and M = 1 for subtract

Figure 1

IC DESCRIPTION

<u>7483</u> is a 4-bit binary adder with fast carry. The pin-out for the 7483 is shown in Figure 2. The two 4-bit input binary numbers are applied to the inputs A(1:4) and (B1:4). The 4-bit sum is obtained from S(1:4). Ci and Co are the carry input and carry output pins.



Figure 2

PROCEDURE

1. Connect the adder/subtractor circuit given in Fig.4. Apply the following numbers in 4-bit binary to circuit and select the operation with the select (M), and record the sum (S) and carry-out (C0).

Decimal	Sum				Carry Out
A + B	<i>S3</i>	<i>S2</i>	<i>S1</i>	<i>S0</i>	C0
8 + 3					
12 – 9					
(-2) + 5					
3 – 15					
(-6) – (-1)					
(-3) – (-12)					

2. Comment on "Select" (M) and "Carry Out" (C0) for each operation performed in procedure 1.