Lab Sheet-1

ADDITION OF TWO UNSIGNED INTEGER BINARY NUMBER

Objective

To design n-bit (4-bit) adder for unsigned integer binary numbers.

A full-adder is a combinational circuit that forms the arithmetic sum of the three inputs bit. It consists of three inputs and two outputs .Two of the input **a** and **b** (say) represent, the bit **c** (say) represents the carry from the previous lower significant bit position. The **S** (say) represents the value of the least significant bit of the sum while **C** (say) gives the output carry. The truth table for full-adder is given below which shows the value of the carry out and sum under difference combinational values of the input bits. It is clear that when all input bits are 0, the output (S) is 0. The S output is equal to 1 when only one input is equal to 1 or when all three inputs are equal to 1. The C output has a carry 1 if two or three inputs are equal to 1.

Inputs			**Outputs**	
a	**b**	**c**	**C**	**S**
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

Truth table for full adder

Mathematical expression for the full adder is

$S = (a + b + c) \%2$

$C = (a + b + c)/2$

The logical expression for the full adder is

$S = a \oplus b \oplus c$

$C = a\,b + (a \oplus b)\,c$

The logical diagram of the full adder is shown below:

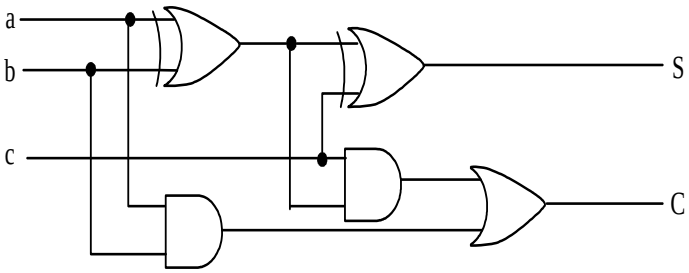

Figure 1.1 Logical diagram of the full-adder.

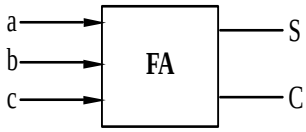

Figure 1.2 Block diagram

n-bit binary adder is constructed with n full-adder connected in cascade with the output carry from one-full-adder connect to the input carry of the next full-adder. The figure below shows the circuit for 4-bit binary adder.

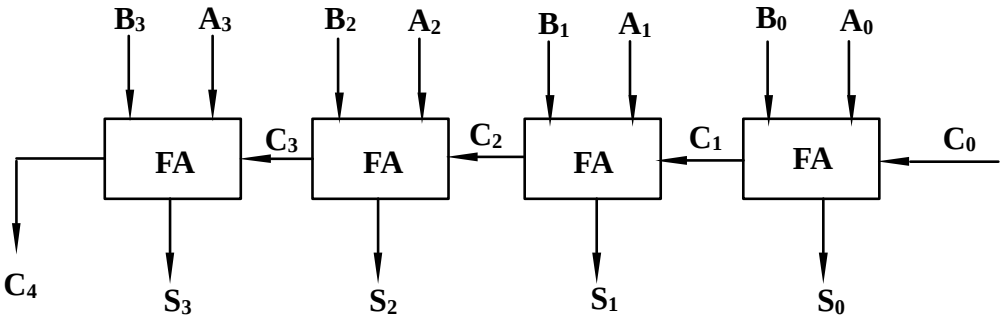

Figure 1.3 4-bit binary adders

To implement the add operation in software, we used the variables that holds the data and mathematical expressions that perform the arithmetic addition.