

DESIGN A 4-BIT ADDER AND 4-BIT SUBTRACTOR

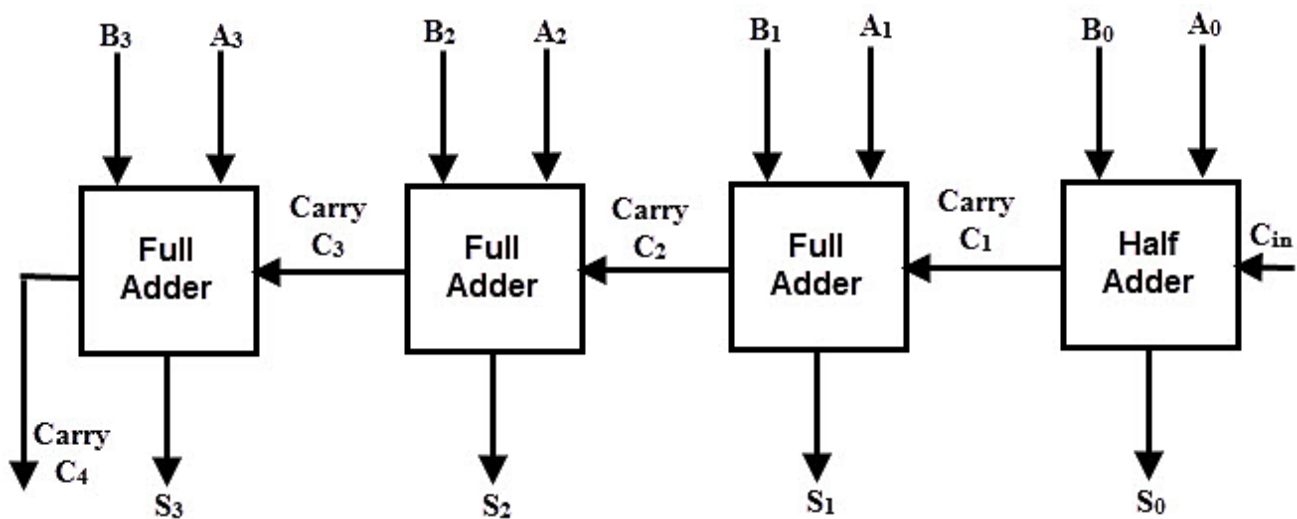
AIM:

To design and simulate a 4-bit adder and a 4-bit subtractor using full adders and full subtractors as components.

4-BIT ADDER:

The 4-bit adder adds two 4-bit binary inputs and the result is produced in the output. In order to create a Full 4-bit adder, we will use four Full 1-bit adders and connect them. This way, the least significant bit on the far right will be produced by adding the first two bits, then it will carry out (if any) a bit to the next two bits to add. This will continue three more times until it is done. In the end, the last carry out will be the carry output.

The block diagram of a 4-bit adder is given below:



The i/o ports needed to be declared for the formation of 4-bit adder is given below:

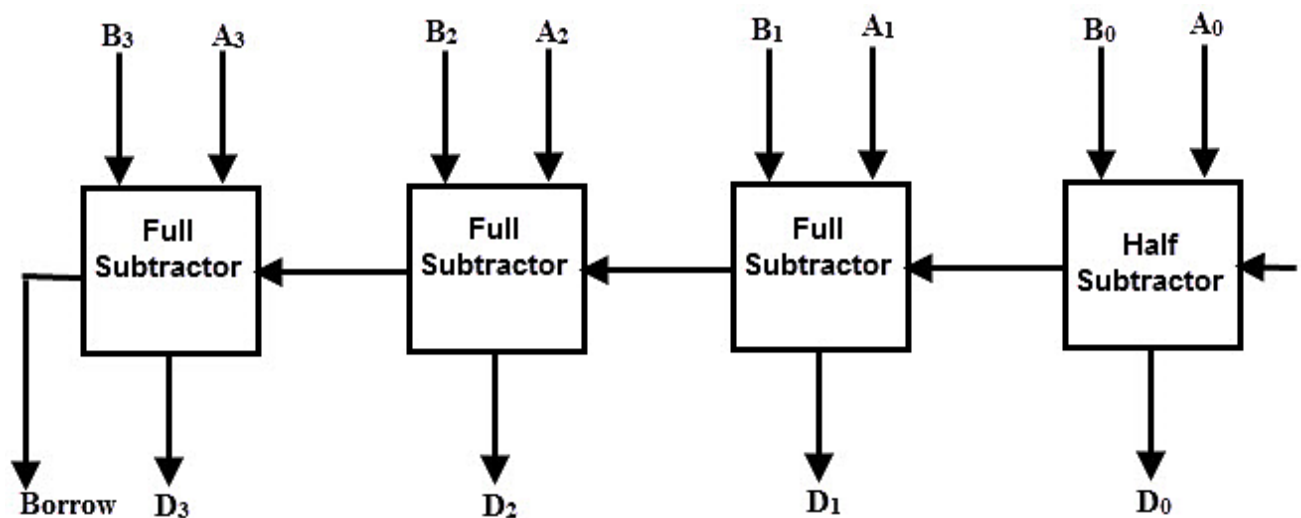
Port Name	INPUT/OUTPUT	Bus
A	In	4-Bit Bus (3 downto 0)
B	In	4-Bit Bus (3 downto 0)
Cin	In	No
SUM	Out	4-Bit Bus (3 downto 0)
Cout	Out	No

NB: Use temporary variable where ever necessary.

4-BIT SUBTRACTOR:

The 4-bit subtractor subtracts two 4-bit binary inputs and the result is produced in the output. In order to create a Full 4-bit subtractor, we will use four Full 1-bit subtractors and connect them. This way, the least significant bit on the far right will be produced by subtracting the first two bits, then it will pass the borrow out (if any) a bit to the next two bits to subtract. This will continue three more times until it is done. In the end, the last borrow out will be the borrow output.

The block diagram of a 4-bit adder is given below:



The i/o ports needed to be declared for the formation of 4-bit subtractor is given below:

Port Name	INPUT/OUTPUT	Bus
A	In	4-Bit Bus (3 downto 0)
B	In	4-Bit Bus (3 downto 0)
Bin	In	No
DIFF	Out	4-Bit Bus (3 downto 0)
Borrow	Out	No

NB: Use temporary variable where ever necessary.