FULL ADDER.

A Full Adder circuit must be used for the 2's, 4's, 8's, 16's, and so forth places in binary addition. This is used for all binary place values except the 1's place. It also must be used when it is possible to have an extra carry input.

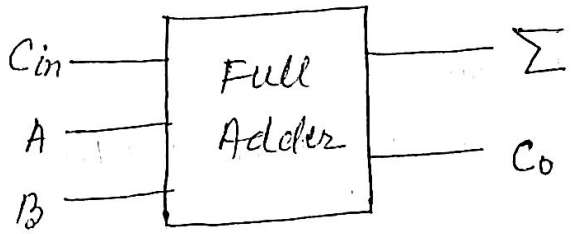

Fig - I. Block diagram of Full Adder.

Fig 1 shows the block diagram of Full adder having three inputs Cin, A and B and two outputs Σ and Co. Fig 2. shows the truth table for all the possible combination of A, B and Cin (Carry input)

Truth Table.

Inputs			Outputs	
Cin	A	B	Σ	Co
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1
Carry+A+B			Sum	Carry out

1 0 1 ← carry
1 0 1 ← A
1 0 1 ← B
Input
1 0 1 0 ← Sum.

Fig(2) -

The logic diagram of full adder is shown below in fig 3(a) with OR, XOR and AND gate.

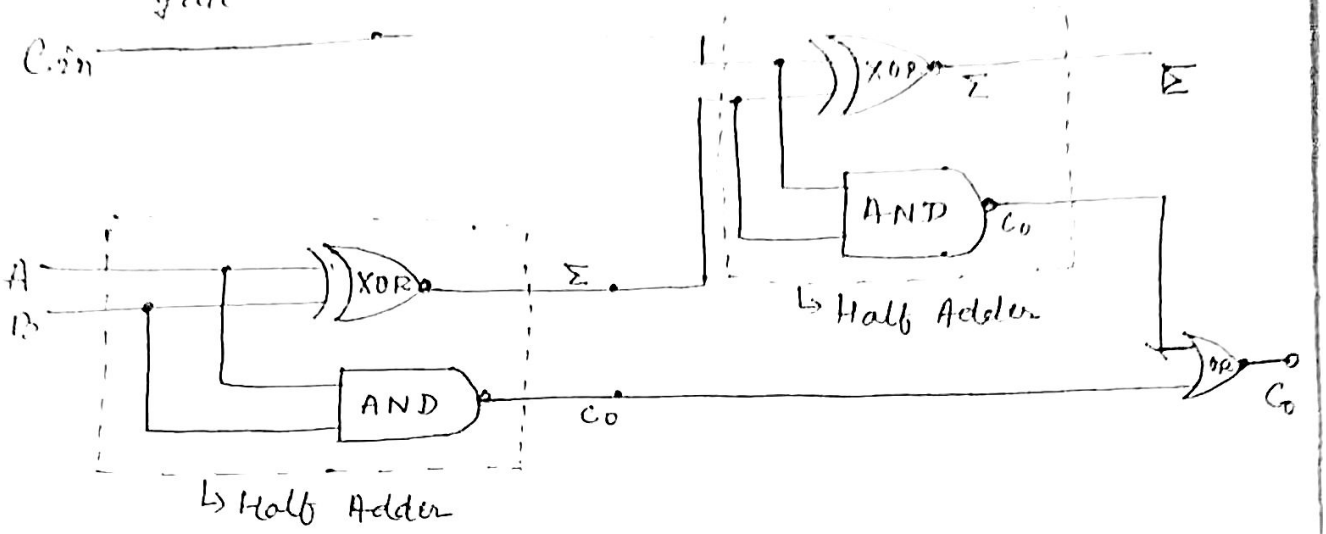

Fig 3(a) Full Adder diagram:

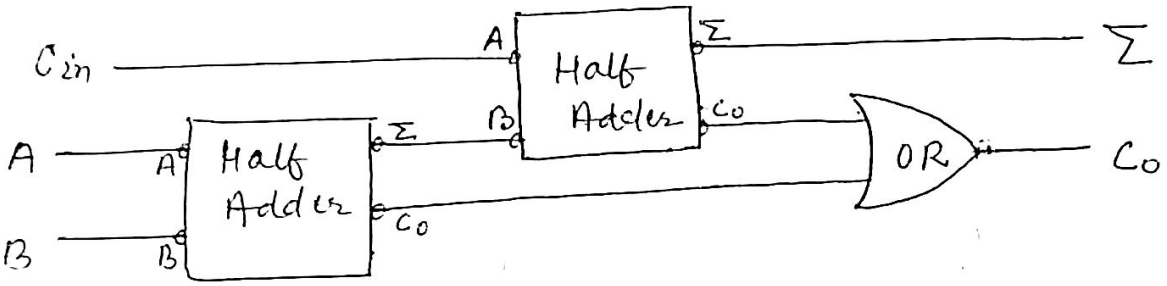

Fig. 3(b) Full Adder construction from Half Adder & OR gate.

One of the easiest methods for forming the combinational logic for a full adder is diagramed fig 3(b); two half adder circuits and an OR gate are used.

The expression for this arrangement is $A \oplus B \oplus Cin = \Sigma$

The expression for the carry out is

$$A \cdot B + Cin \cdot (A \oplus B) = Co.$$

Application: Half and Full adders are used together. For 1s place one half adder is needed and two full adders for the 2s place and 4s place value are needed.

However, many of these circuits are needed to add longer problems.

Many circuits similar to half and full adders are part of a microprocessors arithmetic logic unit (ALU). These circuits are then used for adding 8 bit or even - 16 or 32 - bit binary system.

The microprocessors ALU can also subtract using the same half and Full Adder circuits.