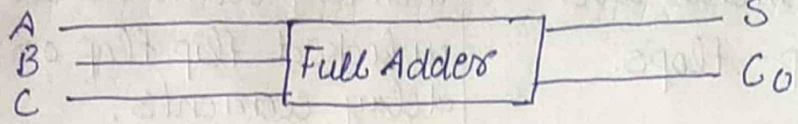
Q.2

Ans:- Full adder:- Full adder is a circuit that performs the addition of three binary digits. it has three inputs A, B and C with two outputs S and Co, where C is the previous Carry.



(2) if there are three input variables the combinations are eight ($2^3 = 8$). Now from the truth table of the full adder.

Inputs			Outputs	
A	B	C	S	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

For S

A \ BC	00	01	11	10
0	0	$\boxed{1}$ 1	3	$\boxed{1}$ 2
1	$\boxed{1}$ 4	5	$\boxed{1}$ 7	6

For Co

A \ BC	00	01	11	10
0	0	1	1 3	2
1	4	1 5	1 7	1 6

③ Sum: $S = ABC + A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C$

Carry:- $C_o = AB + AC + BC$

④ A full adder can be implemented using two half adders and one OR Gate.

Sum: $S = ABC + A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C$

$= ABC + \bar{A}\bar{B}C + A\bar{B}\bar{C} + \bar{A}B\bar{C}$

$= C(AB + \bar{A}\bar{B}) + \bar{C}(A\bar{B} + \bar{A}B)$

$= C(A\bar{B} + \bar{A}B)' + C'(A\bar{B} + \bar{A}B)$

$= (A \oplus B) \oplus C$

Carry:- $C_o = AB + AC + BC$

$= AB + C(A+B)$

$= AB + C(A+B)(A+\bar{A})(B+\bar{B})$

$= AB + C[AB + A\bar{B} + \bar{A}B]$

$= AB + ABC + C(A\bar{B} + \bar{A}B)$

$= AB(1+C) + C(A \oplus B)$

$= AB + C(A \oplus B)$