Experiment -5

★ **Aim :-** To verify and study the operation of full adder

★ **Apparatus :-** Bread board, connecting wires, power supply, IC 7408, IC 7432, IC 7486, LED display, board.

★ **Theory :-** Full adder is a digital circuit used to calculate the sum of three binary bits. Full adder are complex and difficult to implement when compared to half adders. Two of the bits are the same as before which are A, the augend bit and B, addend bit. the additional third bit is carry bit from the previous stage and is called 'Carry' - in generally represented by CIN. It calculates the sum of three bits along with the carry. the output carry is called Carry-Out and is represented by COUT or Carry-OUT.

In order to implement a combinational circuit for full adder, it is clear from the equations derived above, that we need four 3-input AND gates and one 4-input OR gate. for sum and three 2-input AND gates and one 3-input OR gate for Carry-out.

i) **Full adder using NAND gates :-** A NAND gate is one of the universal gates and can be used to implement any design logic

ii) **Full adder using NOR gates :-** A NOR gate is one of the universal gates and can be used to implement any design logic.

★ **Procedure :-**

1. Construct circuit as per the diagram.
2. Input the IC's on bread board
3. Wire V_{cc} and ground to all IC's.

Teacher's Signature

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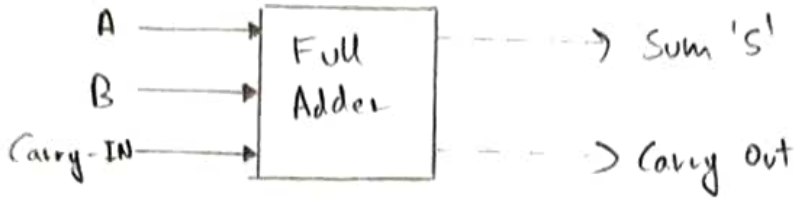
4. Verify the truth table

★ Result :- Operation of full adder has been verified.

★ Precautions :-

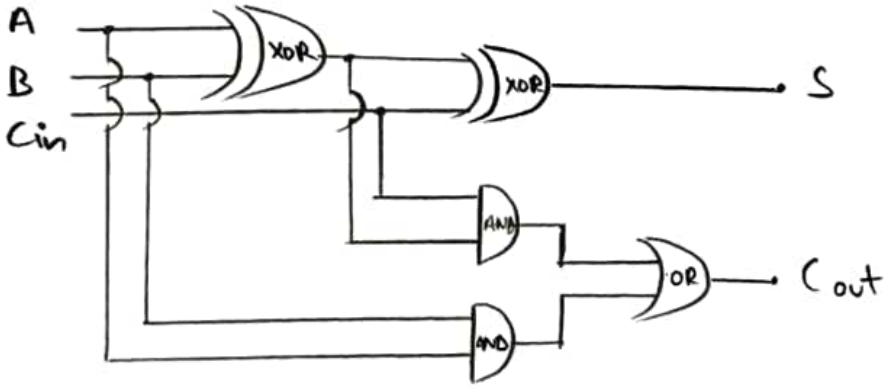
1. Insert the IC's carefully in the breadboard without damaging.
2. Switch off breadboard when not in use.



Truth table For Full Adder

Input			Output	
A	B	Cin	Sum	Carry
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

★ Full Adder Logic Diagram :-



★ K-Map for Sum :-

A \ BCin	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$$S = A'B'C_{in} + A'BC_{in}' + AB'C_{in}' + ABC_{in}$$

★ K-Map for Carry :-

A \ BCin	00	01	11	10
0	0	0	1	0
1	0	1	1	1

$$Cout = AB + BC_{in} + AC_{in}$$