

# HALF/FULL ADDER & HALF/FULL SUBTRACTOR

Aim: - To realize half/full adder and half/full subtractor.

- i. Using X-OR and basic gates
- ii. Using only nand gates.

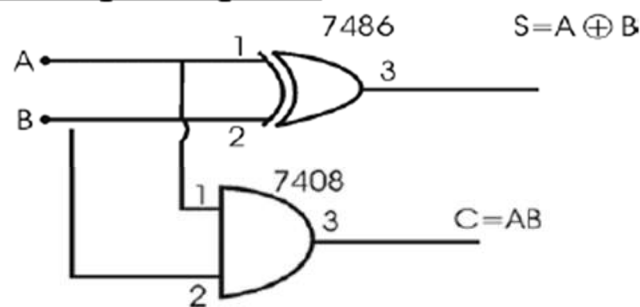
Apparatus Required: -

IC 7486, IC 7432, IC 7408, IC 7400, etc.

Procedure: -

1. Verify the gates.
2. Make the connections as per the circuit diagram.
3. Switch on  $V_{cc}$  and apply various combinations of input according to the truth table.
4. Note down the output readings for half/full adder and half/full subtractor sum/difference and the carry/borrow bit for different combinations of inputs.

Half Adder using basic gates:-



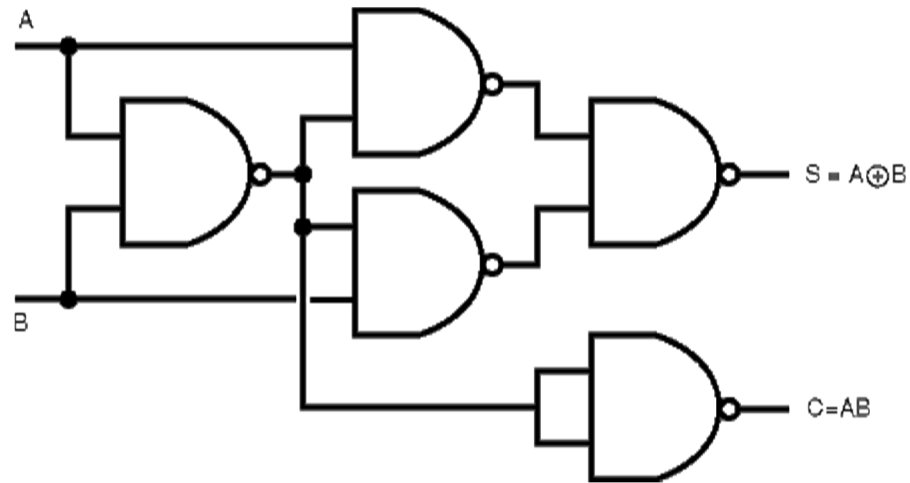
$$S = \bar{A}B + A\bar{B}$$

$$S = A \oplus B$$

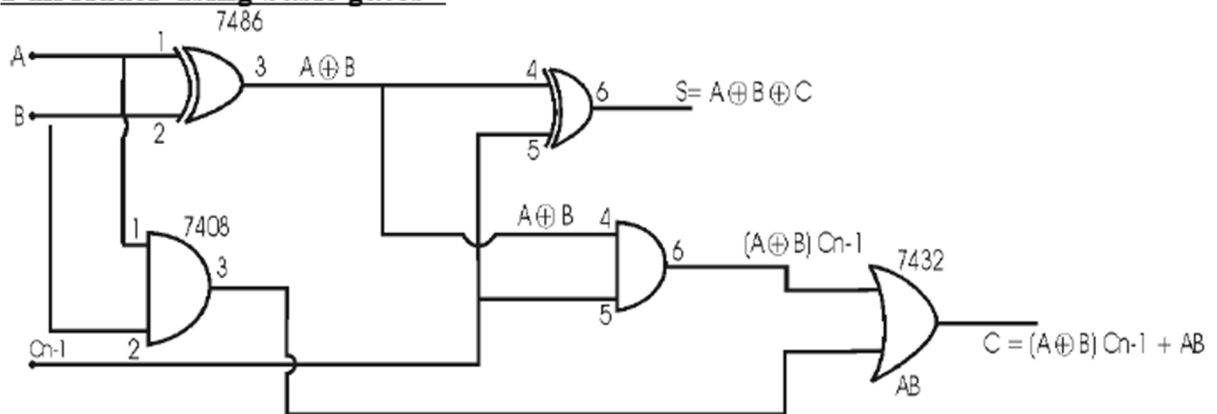
$$C = AB$$

**The Half Adder**

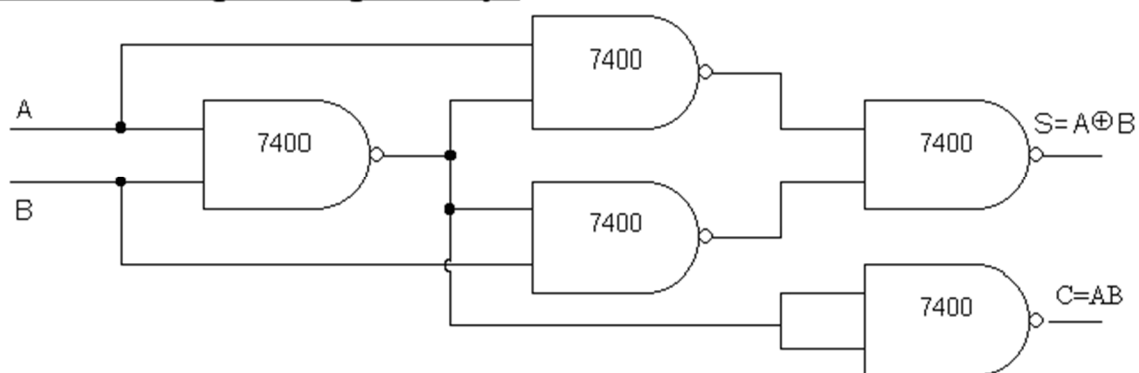
(a) Construct the following circuit as shown in Figure



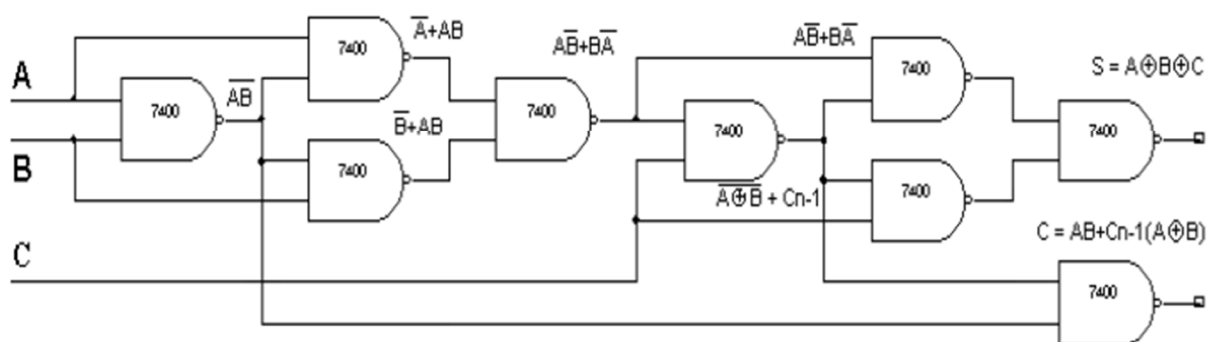
**Full Adder using basic gates:-**



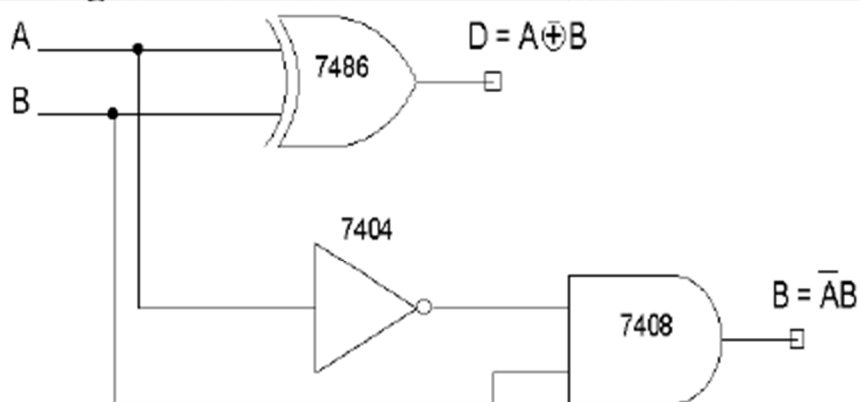
Half Adder using NAND gates only:-



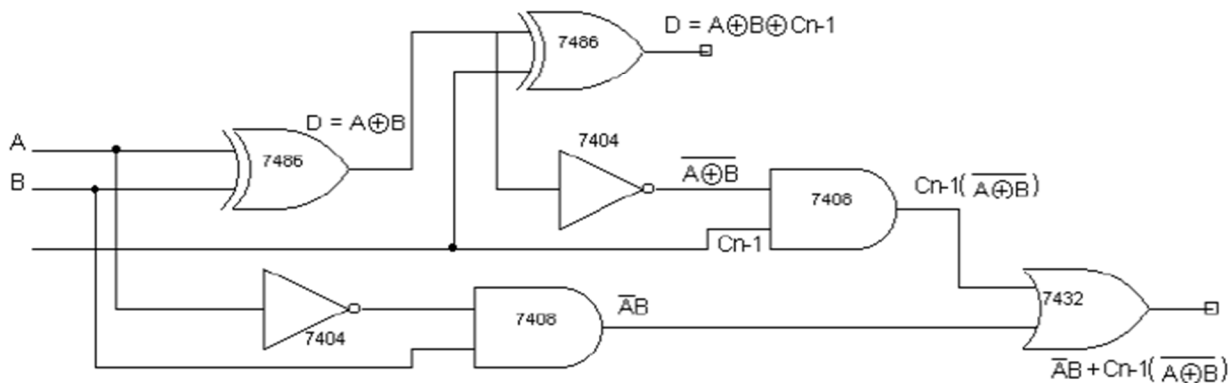
Full Adder using NAND gates only:-



### Using X – OR and Basic Gates (a)Half Subtractor



### Full Subtractor



Half Adder					
A	B	S	C	S(V)	C(V)
	0	0	0		
0	1	1	0		
1	0	1	0		
1	1	0	1		

Half Subtractor					
A	B	D	B	D(V)	B(V)
0	0	0	0		
0	1	1	1		
1	0	1	0		
1	1	0	0		

Full Adder						
A	B	C <sub>n-1</sub>	S	C	S(V)	C(V)
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 Subtractor						
A	B	C <sub>n-1</sub>	D	B	D(v)	B(v)
0	0	0	0	0		
0	0	1	1	1		
0	1	0	1	1		
0	1	1	0	1		
1	0	0	1	0		
1	0	1	0	0		
1	1	0	0	0		
1	1	1	1	1		