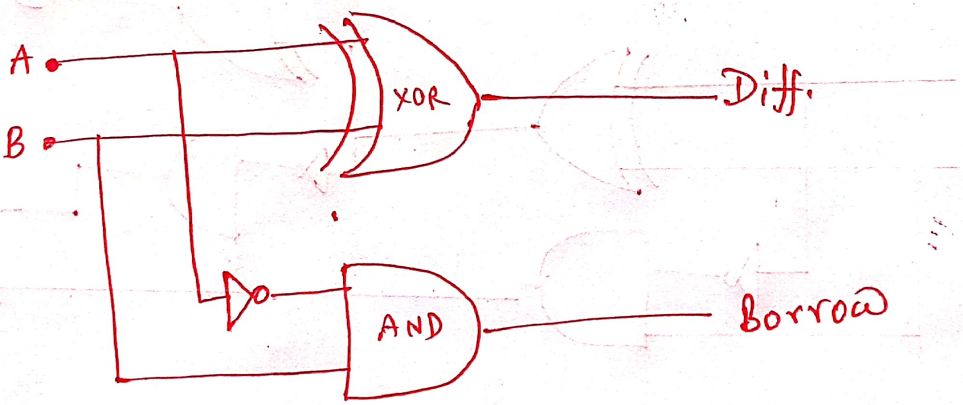
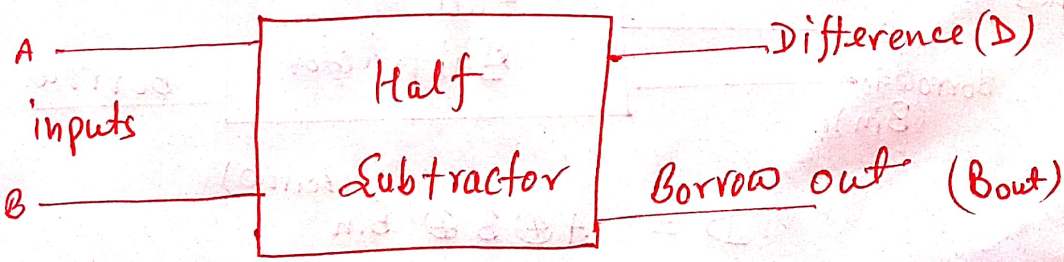
Binary Subtractor

The binary subtractor is another type of combinational arithmetic circuit that produces an output which is the subtraction of two binary numbers.

Half Subtractor :- A half subtractor is a logical circuit that perform a subtraction operation on two binary digits. The half subtractor produces a sum and a borrow bit for the next stage. The subtraction of two binary digits produce two output which are called difference and borrow.





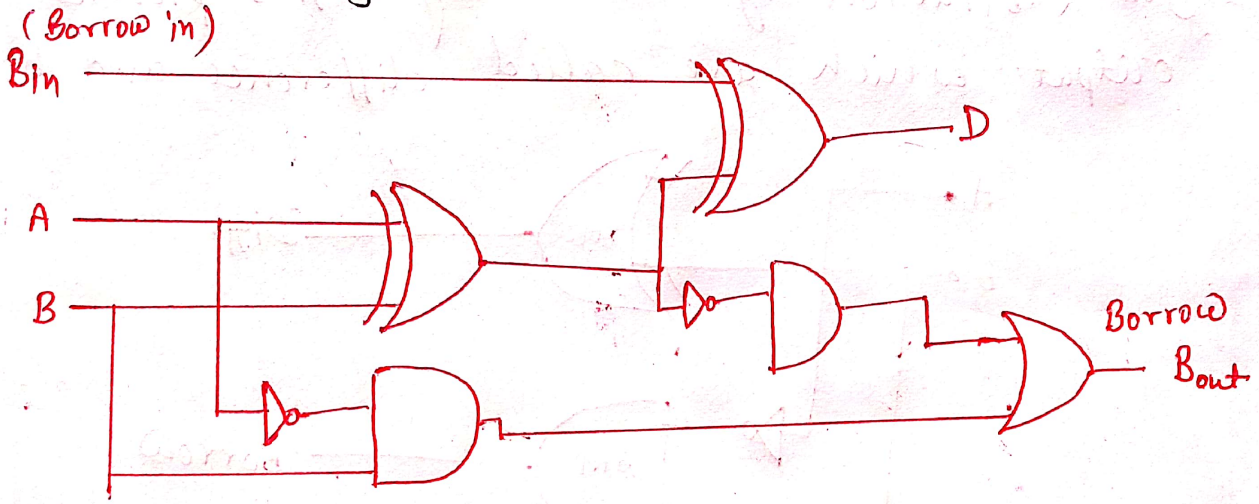
$D = A \oplus B$

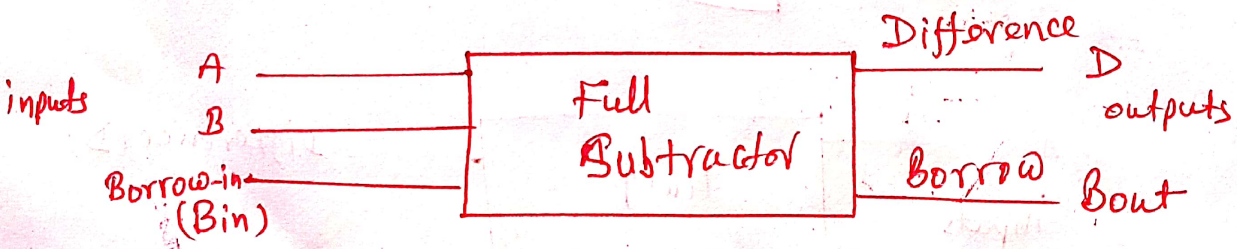
$B = \bar{A} \cdot B$

Half Subtractor truth table:

INPUTS		OUTPUTS	
A	B	D (diff.)	B (Borrow)
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Full Subtractor :-> The main difference between the full subtractor and half subtractor circuit is that a full subtractor has three inputs.





$$D = A \oplus B \oplus B_{in} \quad \text{(Borrow)}$$

$$B_{out} = \bar{A}(B \oplus B_{in}) + B \cdot B_{in}$$

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Full subtractor truth table:

INPUTS			OUT PUTS	
A	B	Bin	D	Bout
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

As the full subtractor circuit the two half subtractors cascaded together the truth table for the full subtractor will have eight different inputs combinations as there are three input variables, the data bits and the borrow-in (Bin), ~~As~~ Also include the difference output D and the Borrow out Bout bit.