* Digital Electronics and Logic Design (DELD) - Practical Number - 2

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Title:-
Full Adder and Full Subtractor

Aim:-
To realize full adder and full subtractor using
a) Basic Gates
b) Universal Gates.

Objective:-
Understanding the working of full adder and full subtractor by only using a) Basic Gates
b) Universal Gates.

Theory:-
a) Full Adder:-
The half adder does not take the carry bit from its previous stage into account. This carry bit from its previous stage is called carry-in bit. A combinational logic circuit that adds two data bits, x and y, and a carry-in bit, C_{in}, is called a full

adder. The Boolean functions describing the full-adder are:

$$S = (x \oplus y) \oplus C_{in} \qquad C = xy + C_{in}(x \oplus y)$$

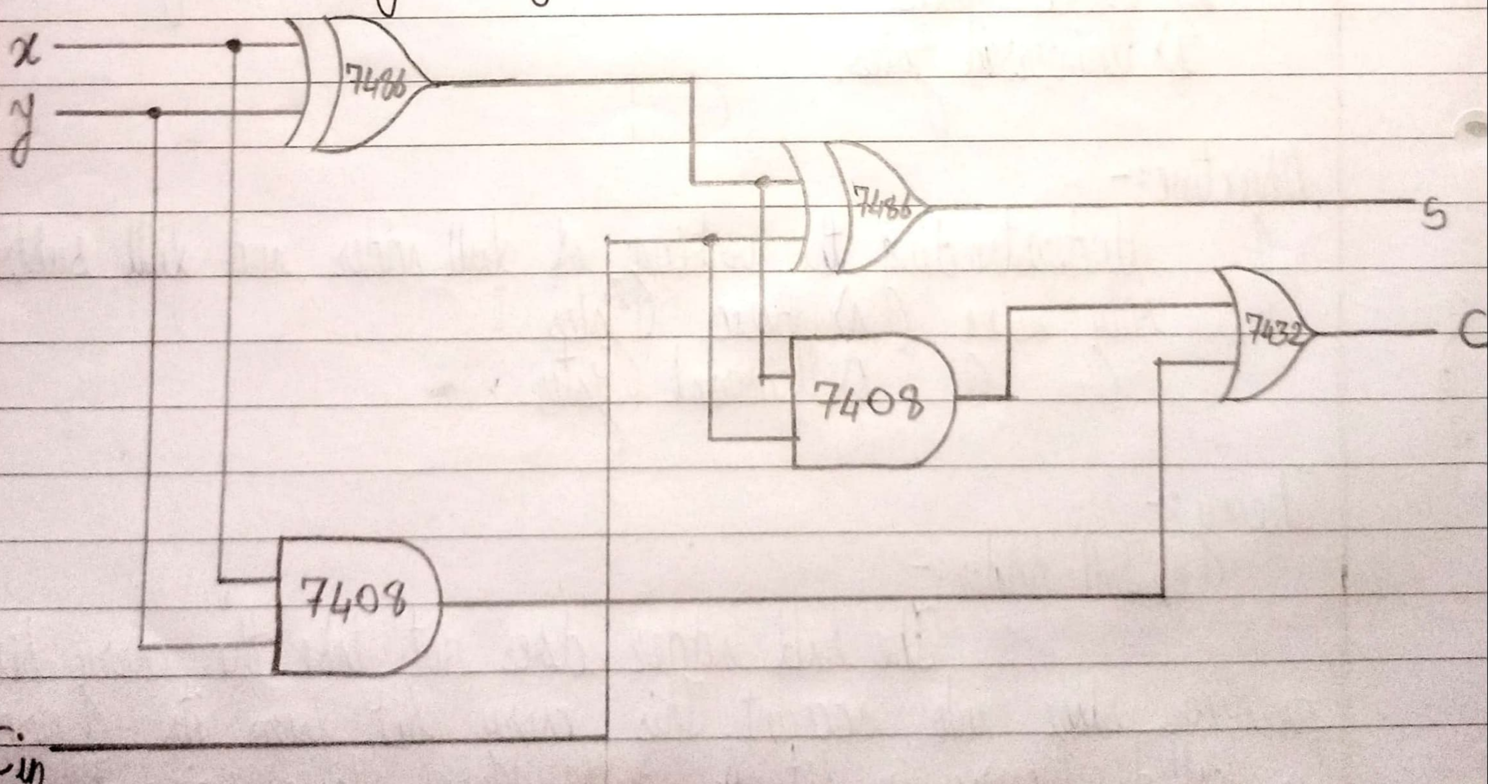
b) Full Subtractor:-

Subtracting two single-bit binary values, B, Cin from a single-bit value A produces a difference bit D and a borrow out Br bit. This is called full subtraction. The boolean functions describing the full-subtructer are:

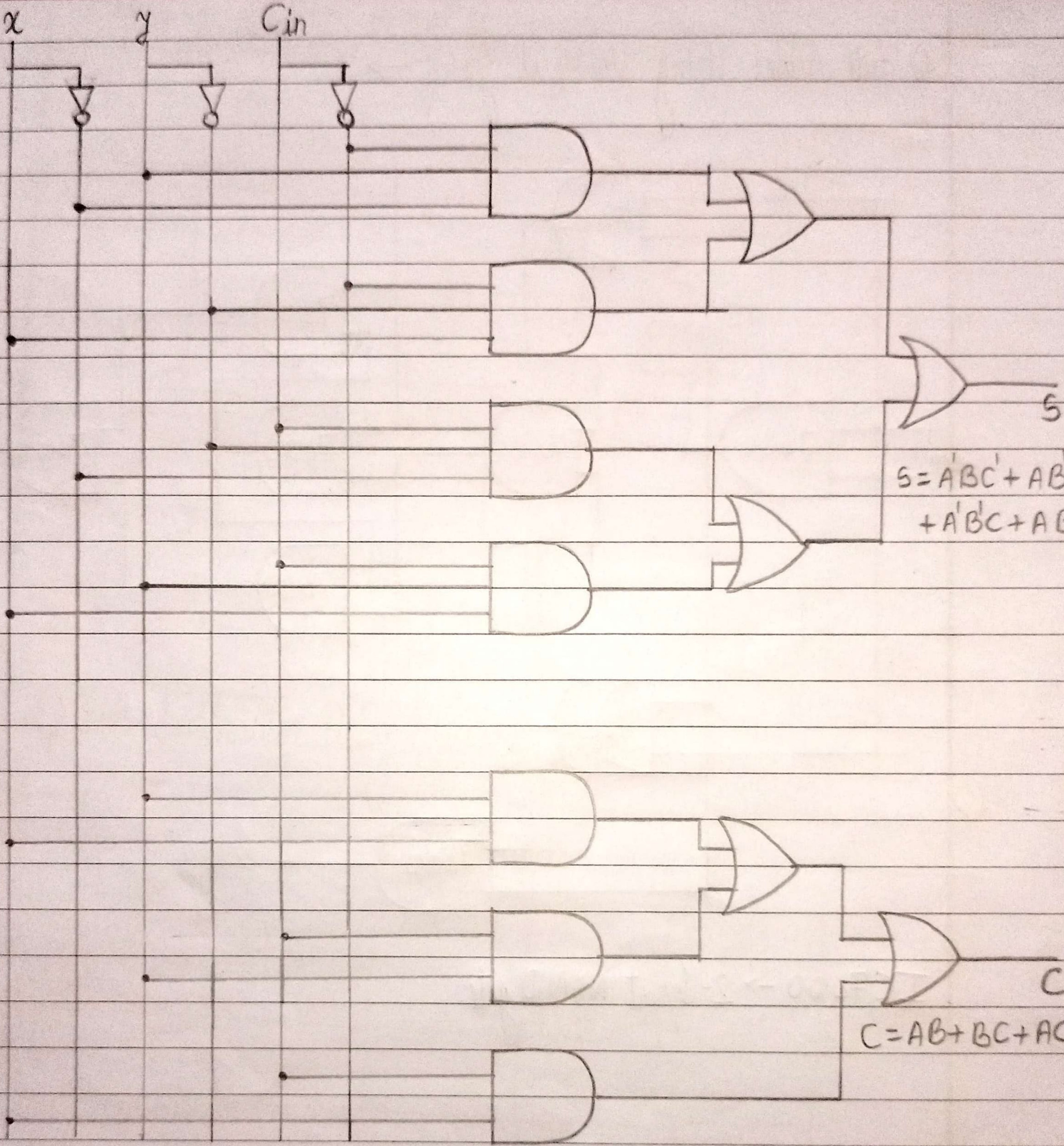
$$D = (A \oplus B) \oplus C_{in} \qquad B_r = A'B + A'(C_{in}) + B(C_{in})$$

Logic Diagram:-

a) Full Adder Using Basic Gates →



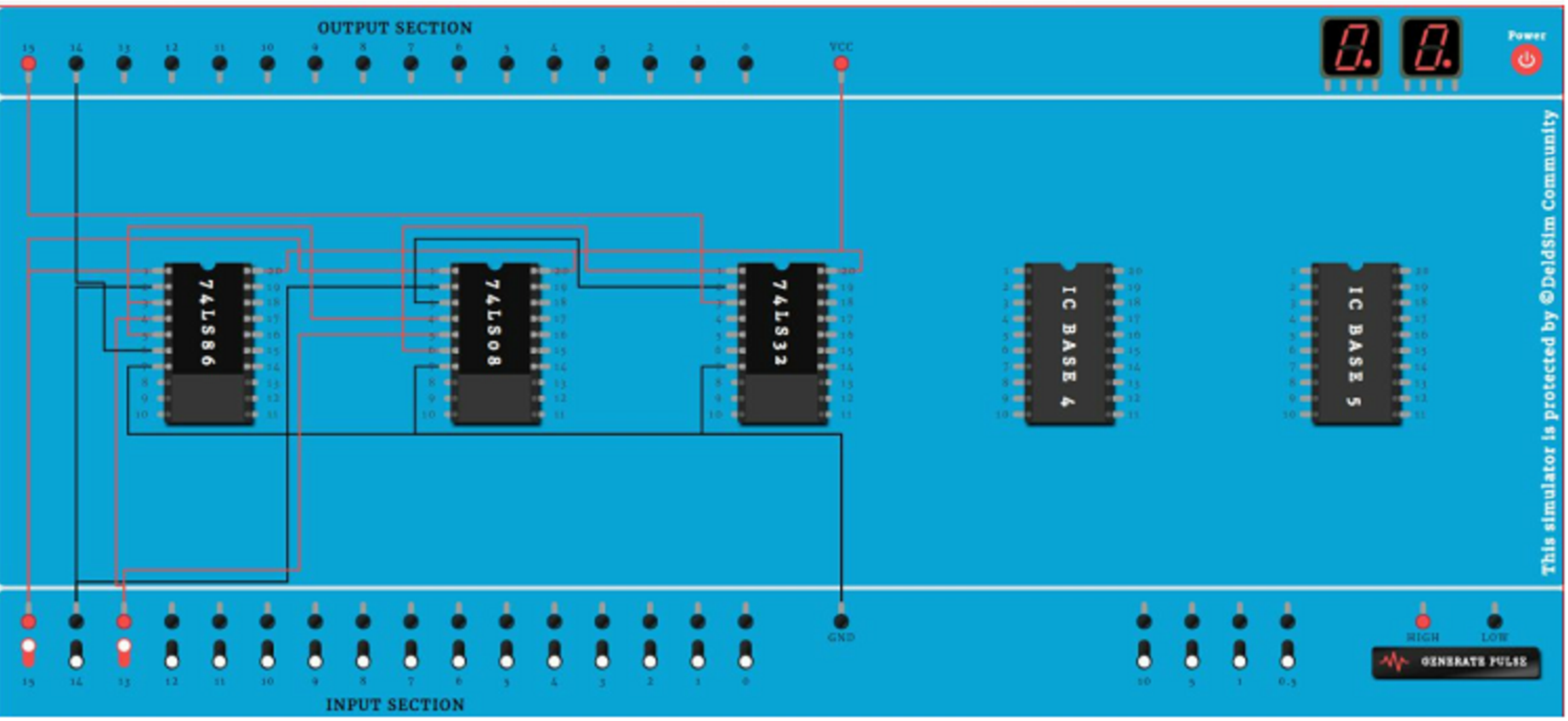
IC 7486 → 2-Input XOR gate, IC 7408 → 2-Input AND gate
IC 7432 → 2-Input OR gate.



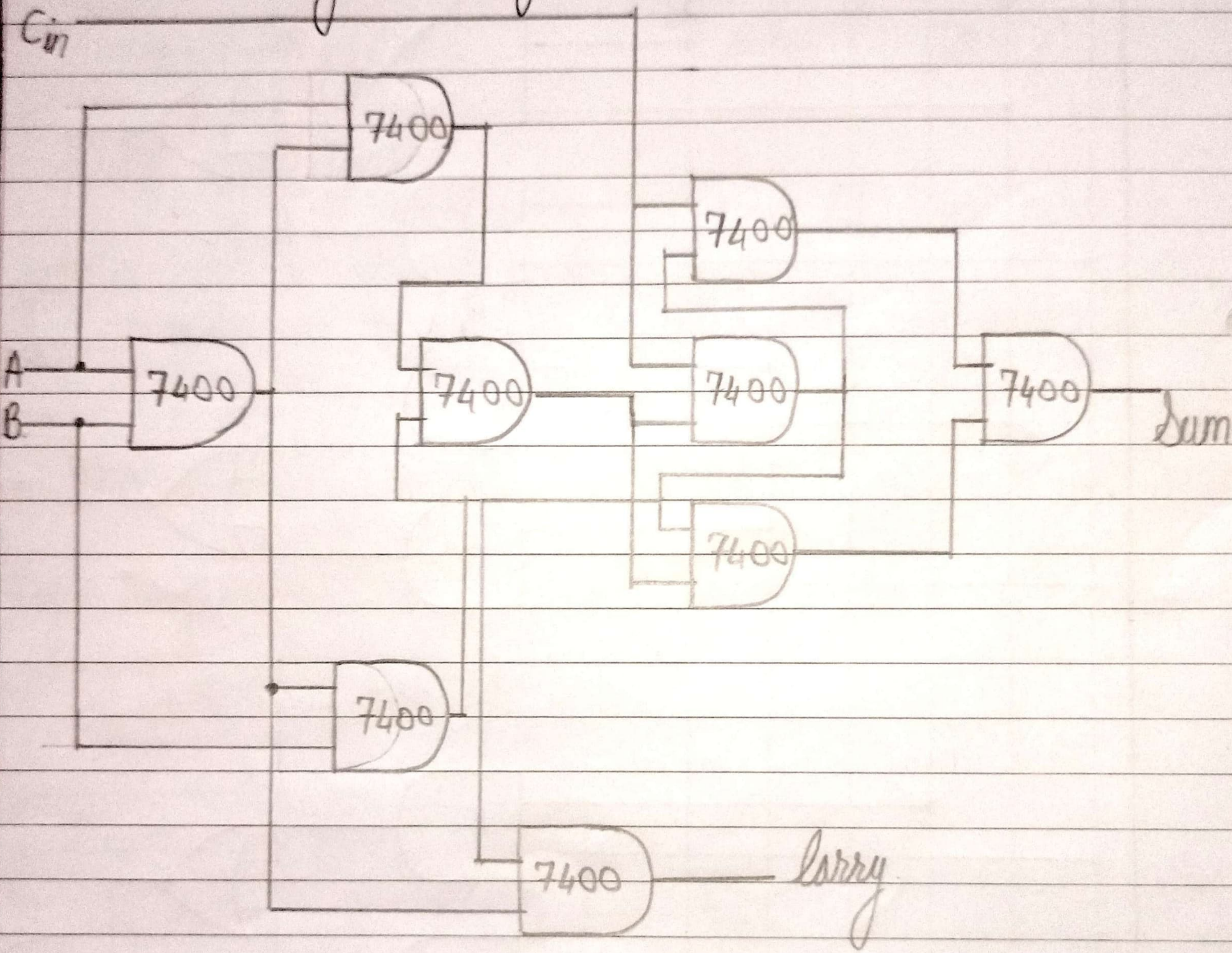
$S = A'BC' + AB'C' + A'B'C + ABC$

$C = AB + BC + AC.$

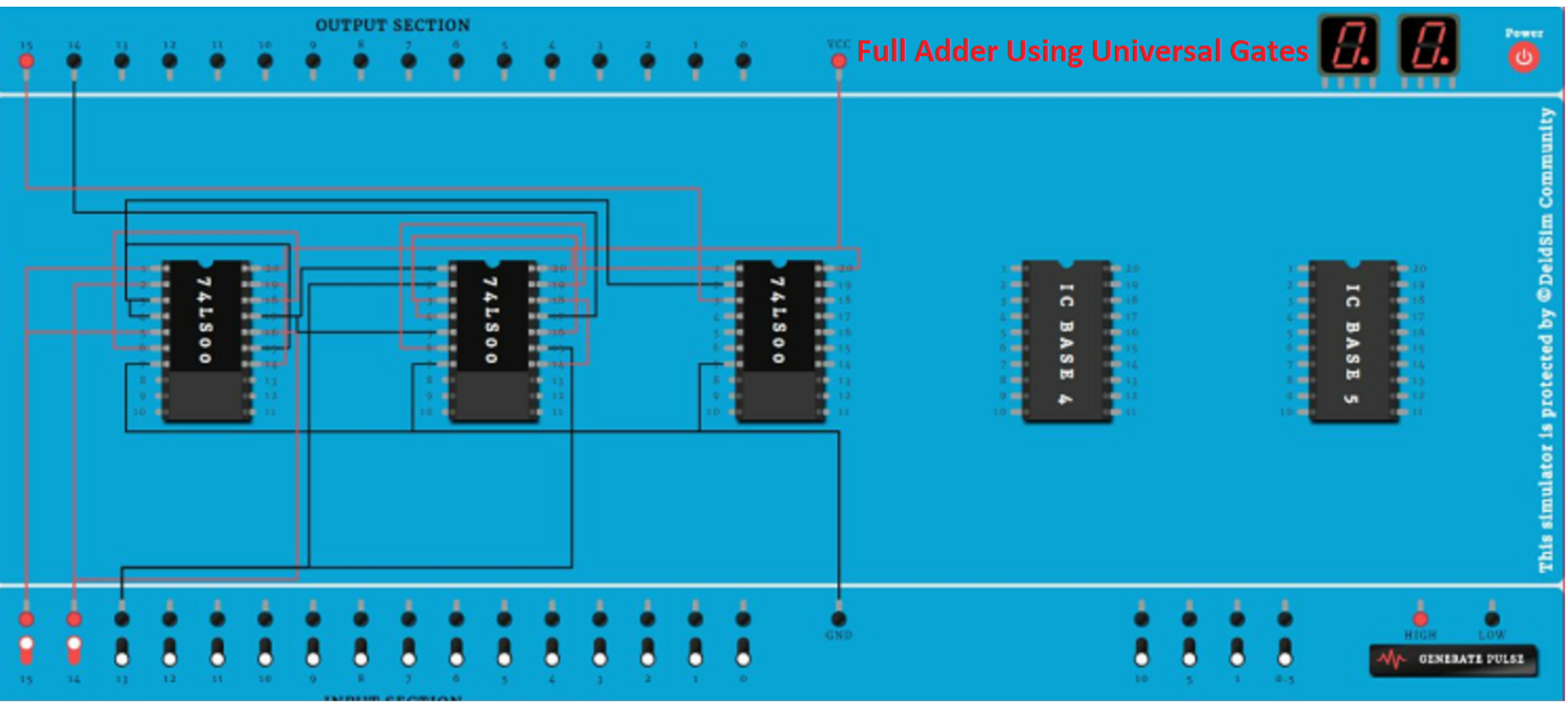
Full Adder Using Basic Gates



b) Full Adder Using Universal Gates →

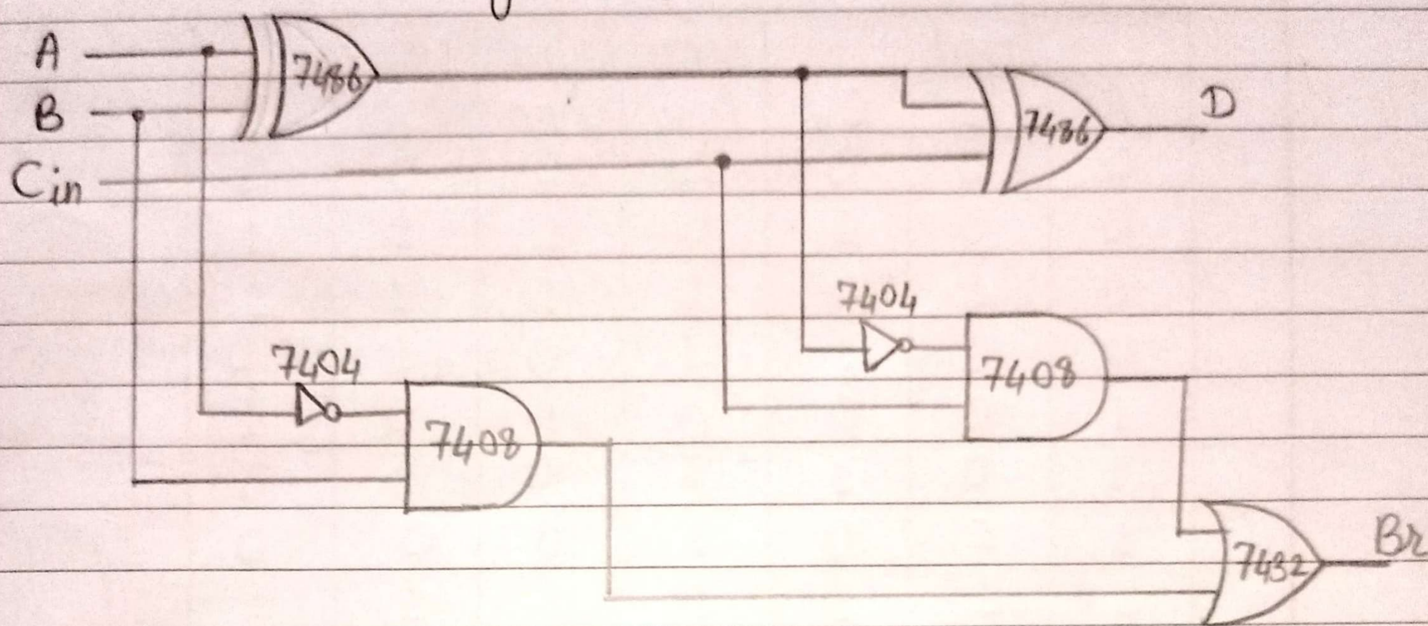


IC7400 → 2-Input NAND gate.



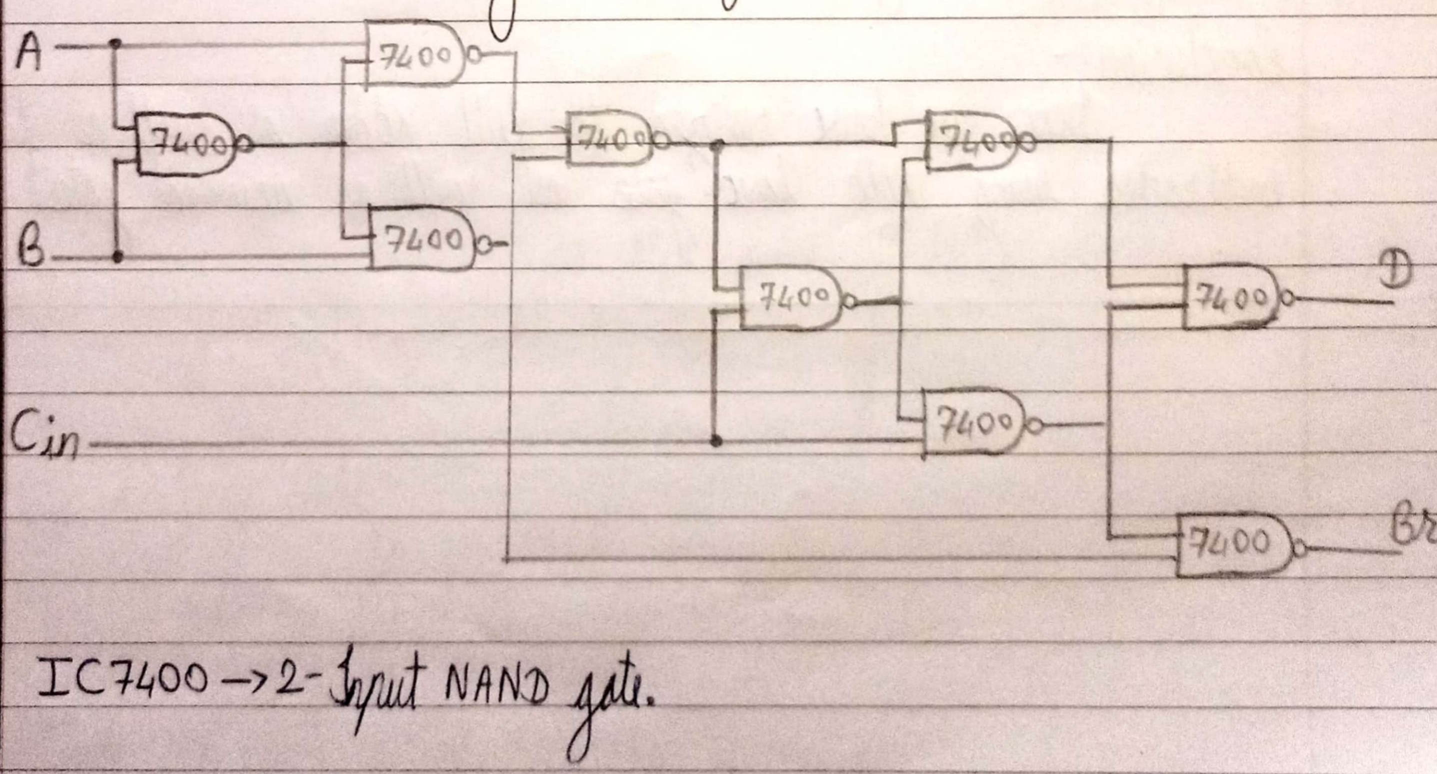
OUTPUT SECTION
VCC
Full Adder Using Universal Gates
Power
74LS00
74LS00
74LS00
IC BASE 4
IC BASE 5
This simulator is protected by ©DeldSim Community
GND
HIGH
LOW
GENERATE PULSE

c) Full Substractor Using Basic Gates →

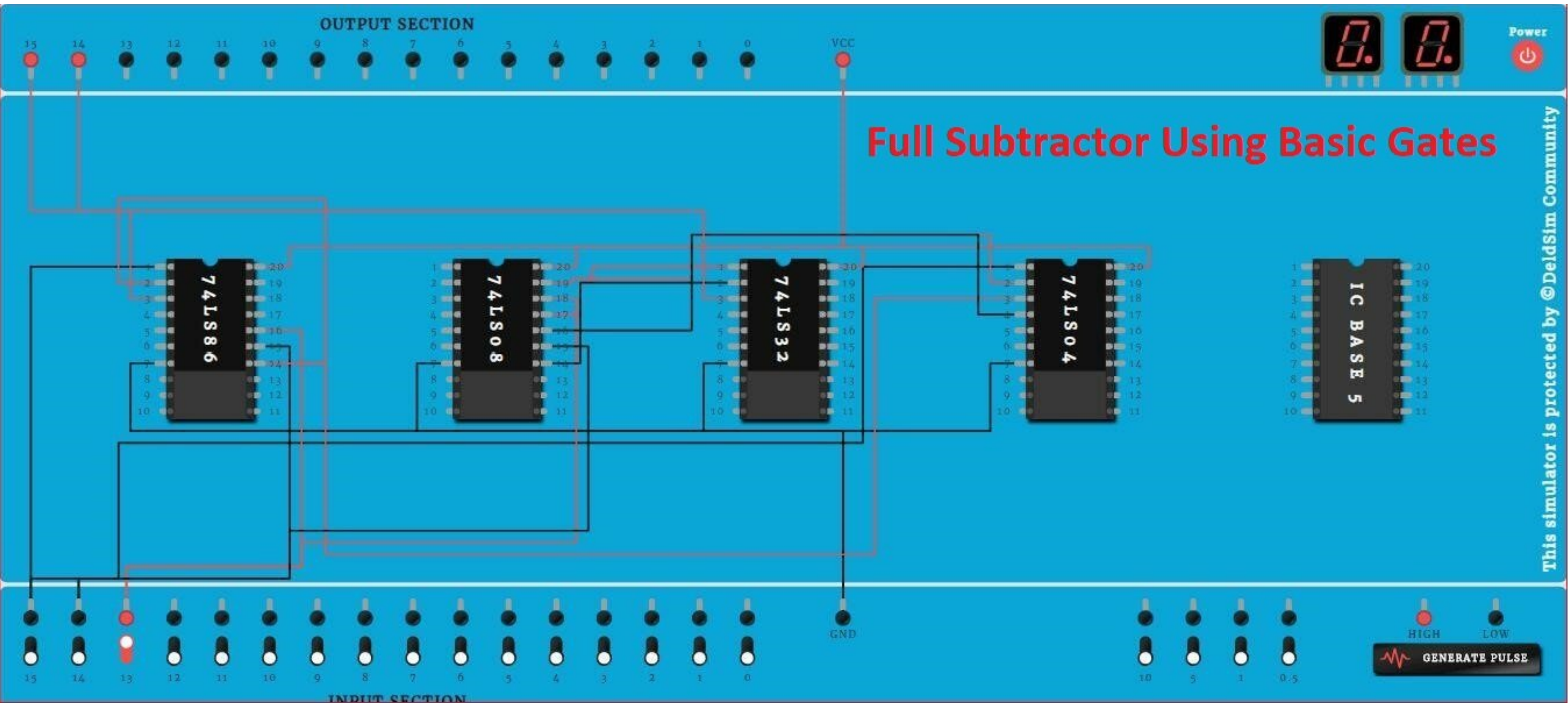


IC7486 → 2 Input XOR gate , IC7404 → NOT gate
IC7408 → 2-Input AND gate , IC7432 → 2-Input OR gate.

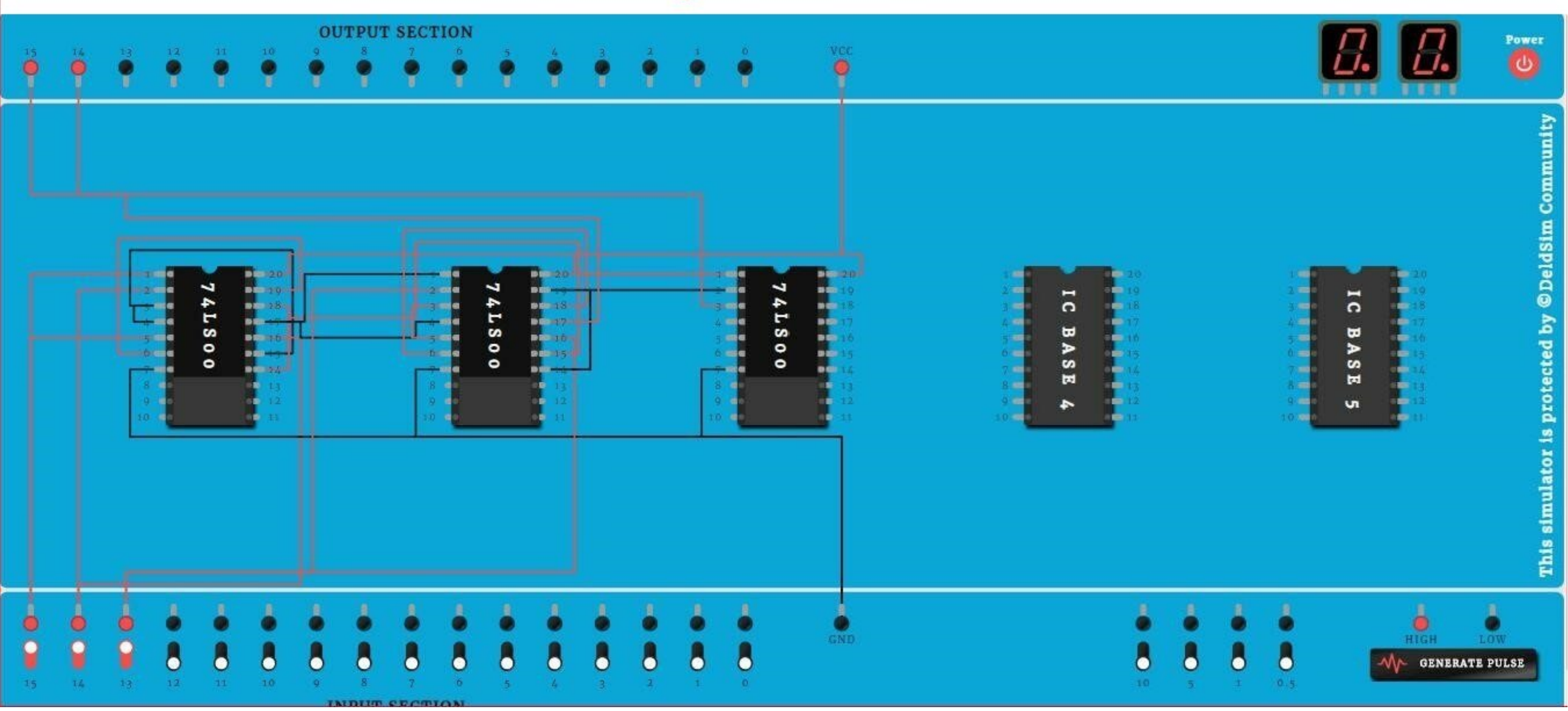
d) Full Subtractor Using Universal Gates →



IC7400 → 2-Input NAND gate.



Full Subtractor Using Universal Gates



Truth Table :-

Input			Adder Output		Subtractor Output	
A	B	Cin	Carry	Sum	Br	D
0	0	0	0	0	0	0
0	0	1	0	1	1	1
0	1	0	0	1	1	1
0	1	1	1	0	1	0
1	0	0	0	1	0	1
1	0	1	1	0	0	0
1	1	0	1	0	0	0
1	1	1	1	1	1	1

Outcomes :-

Thus we have learned how to design and how it works using both basic gates and universal gates.

Conclusion :-

Hence we have realized the full adder as well as full subtractor using both basic gates as well as universal gates.