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EXPERIMENT NUMBER 2

TITLE: HALF ADDER AND FULL ADDER

- ***OBJECTIVE*:**

To verify the truth table of half adder and full adder by using XOR and NAND gates respectively and analyse the working of half adder and full adder circuit with the help of LEDs in simulator 1 and verify the truth table only of half adder and full adder in simulator 2.

- ***APPARTUS REQUIRED:***

- Power supply
- LED
- Resistance
- IC 7408 ,7486,7432

- ***THEORY:***

- Half Adder -

Half adder is a combinational circuit that performs simple addition of two binary numbers. If we assume A and B as the two bits whose addition is to be performed , the block diagram and a truth table for half adder with A, B as inputs and Sum, Carry as outputs.

- Half adder using NAND gate - Five NAND gates are required in order to design a half adder. The circuit to realize half adder using NAND gates is shown below

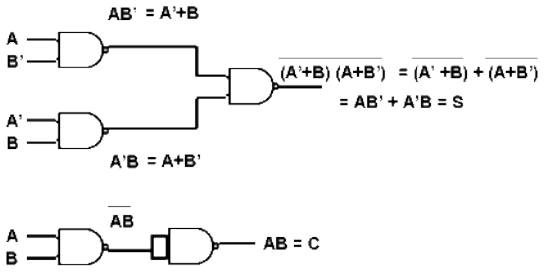


Figure - Realization of half adder using NAND gates.

- Half Adder using NOR gates - Five NOR gates are required in order to design a half adder. The circuit to realize half adder using NOR gates is shown below.

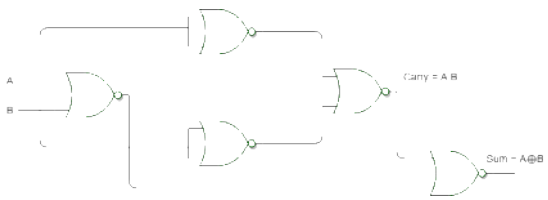


Figure - Realization of half adder using NOR Gate.

➢ Full Adder -

Full adder is a digital circuit used to calculate the sum of three binary bits. Full adders are complex and difficult to implement when compared to half adders. Two of the three bits are same as before which are A, the augend bit and B, the 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 Carry OUT.

- Full adder using NAND gate - NAND gate is one of the universal gates and can be used to implement any logic design. The circuit of full adder using only NAND gates is shown below.

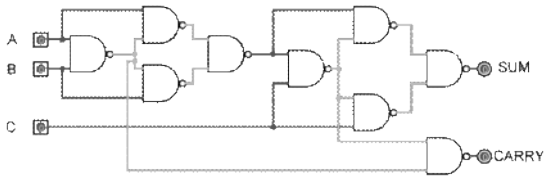


Figure - Full Adder using NAND gates

- Full adder using NOR gate- NOR gate is one of the universal gates and can be used to implement any logic design. The circuit of full adder using only NOR gates is shown below.

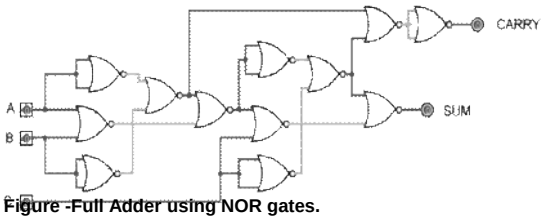
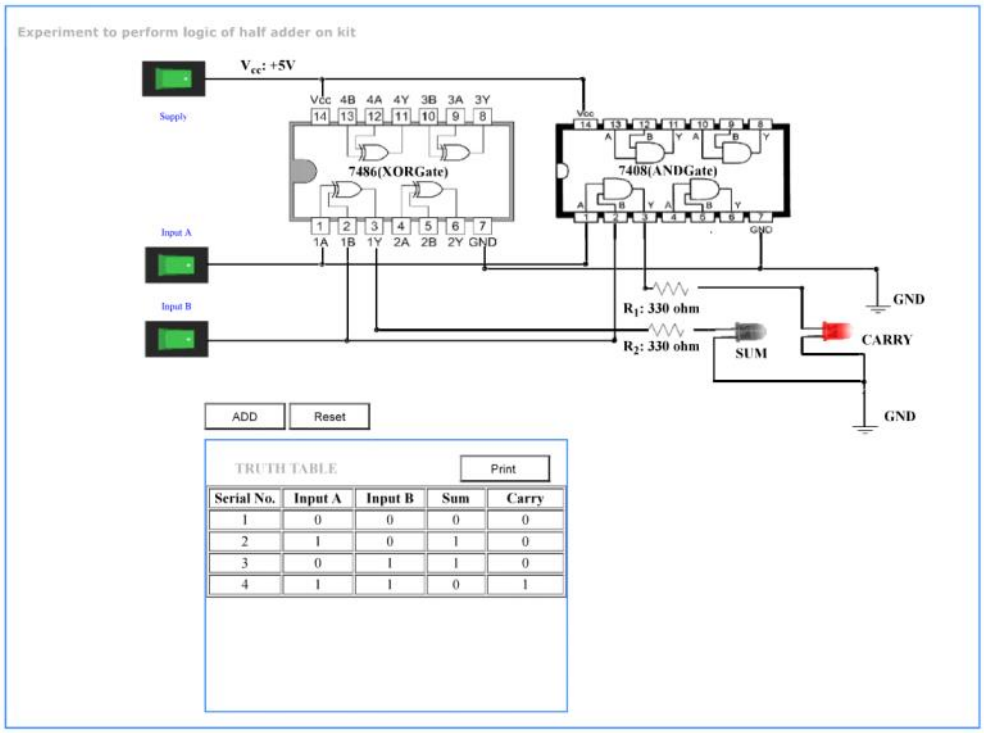


Figure -Full Adder using NOR gates.

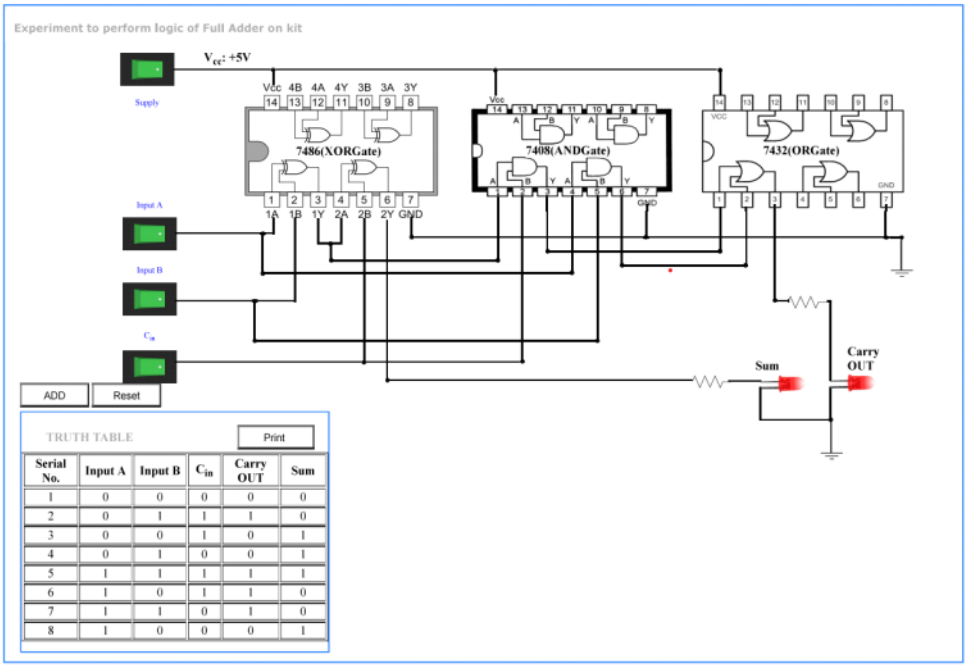
- ***CIRCUIT DIAGRAM :***

➢ HALF ADDER {SIMULATOR 1}:



Serial No.	Input A	Input B	Sum	Carry
1	0	0	0	0
2	1	0	1	0
3	0	1	1	0
4	1	1	0	1

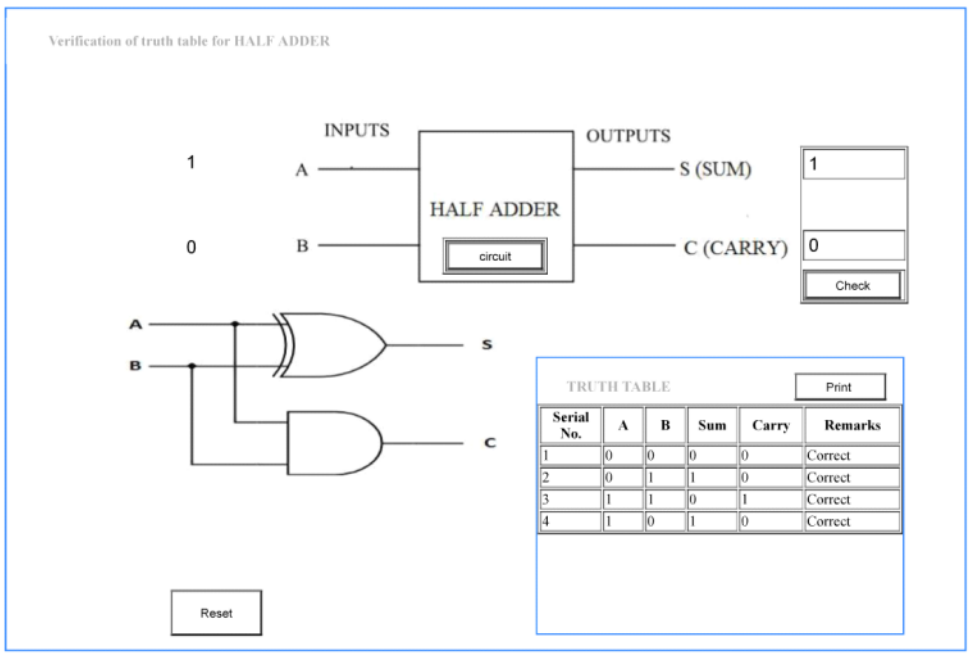
➢ *FULL ADDER {SIMULATOR 1}:*



Serial No.	Input A	Input B	C_{in}	Carry OUT	Sum
1	0	0	0	0	0
2	0	1	1	1	0
3	0	0	1	0	1
4	0	1	0	0	1
5	1	1	1	1	1
6	1	0	1	1	0
7	1	1	0	1	0
8	1	0	0	0	1

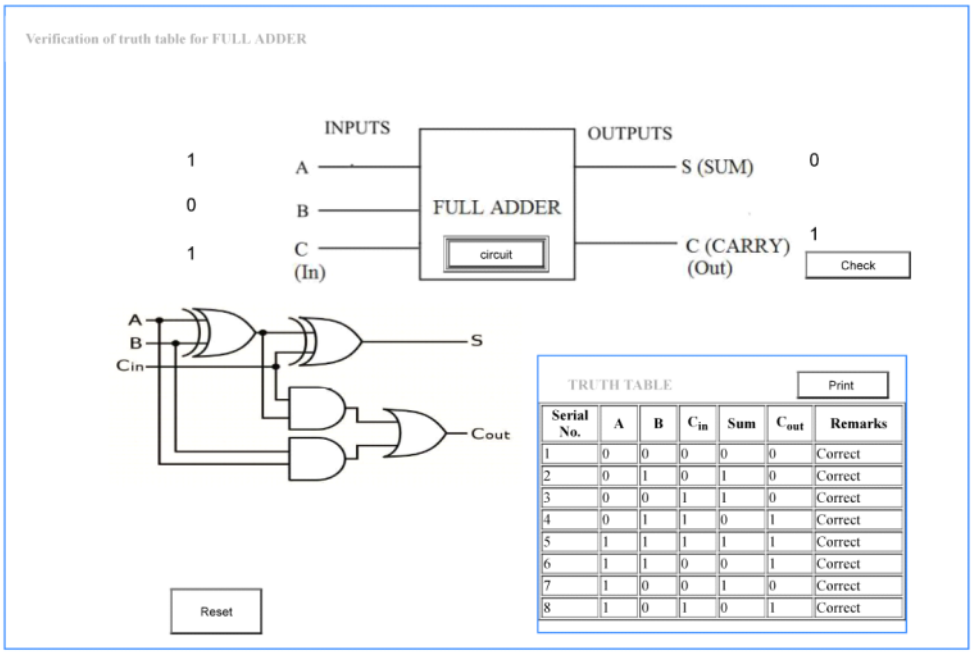
- ***CALCULATION:***

➢ VARIFICATION OF TRUTH TABLE FOR HALF ADDER {SIMULATOR 2}:



Serial No.	A	B	Sum	Carry	Remarks
1	0	0	0	0	Correct
2	0	1	1	0	Correct
3	1	1	0	1	Correct
4	1	0	1	0	Correct

➢ VERIFICATION OF TRUTH TABLE FOR FULL ADDER {SIMULATOR 2}:



Serial No.	A	B	C_{in}	Sum	C_{out}	Remarks
1	0	0	0	0	0	Correct
2	0	1	0	1	0	Correct
3	0	0	1	1	0	Correct
4	0	1	1	0	1	Correct
5	1	1	1	1	1	Correct
6	1	1	0	0	1	Correct
7	1	0	0	1	0	Correct
8	1	0	1	0	1	Correct

- ***RESULT AND CONCLUSION:***

- Verified Truth Table of Half Adder successfully using EX-OR and NAND Gates.
- Verified Truth Table of Full Adder successfully using EX-OR and NAND Gates.

- ***PRECAUTIONS:***

- All the connections should be made properly as per the circuit diagram.
- Connections should be tight and easy to inspect.
- Keep the switch turned off while making connections.