

Experiment - 4

* Aim :- To verify the operation of half adder.

* Apparatus :- Bread board, connecting wires, power supply, IC 7408, IC 7486

* Theory :- Half adder is a combinational circuit that performs simple addition of two binary numbers. If we assume A and B as two bits whose addition is to be performed, the block diagram and the truth table for half adder with A, B as inputs and SUM, CARRY as outputs can be tabulated as shown in diagram. The ~~sum~~ sum output of the binary addition carried out is similar to that of an EX-OR operation. While the ~~sum~~ Carry output is similar to that of AND operation.

the same can be verified with the help of Karnaugh map.

$$\text{SUM} = AB' + A'B$$

$$\text{CARRY} = AB$$

If A and B are binary inputs to the half adder, then the logic function to calculate sum S is EX-OR of A and B and logic function to calculate Carry C is AND of A and B.

As we know, that NAND and NOR are called universal gates as any logic system can be implemented using these two, the half adder circuit can also be implemented using them. We know that half adder circuit has one EX-OR gate and one AND gate.

(i) Half adder using NAND gates :- Five NAND gates are required to design a half adder.

(ii) Half adder using NOR gates :- Five NOR gates are required in order to design a half adder.

Teacher's Signature _____

Date _____

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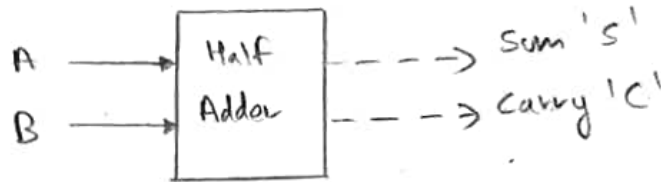
* Procedure :-

1. Construct the circuit as shown in the logic diagram.
2. Insert the correct IC's on the bread board.
3. Wire V_{cc} and ground voltage to all IC's.
4. Verify the output by truth table.

* Result :- operation of half adder has been verified.

* Precautions :-

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



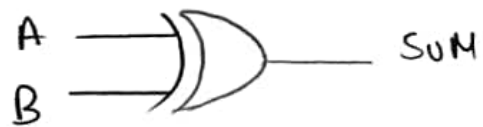
truth table

Input		Output	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

★ K-Map for Sum

A \ B	0	1
	0	1
0	0	1
1	1	0

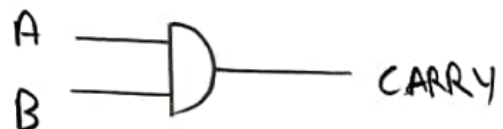
★ 2-Input EX-OR



★ K-Map for Carry

A \ B	0	1
	0	0
0	0	0
1	0	1

★ 2-Input AND



★ Half Adder Logic Diagram

