

Design of Half Adder using NAND gates

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Abstract

The half adder adds two binary digits called as augend and addend and produces two outputs as sum and carry; XOR is applied to both inputs to produce sum and AND gate is applied to both inputs to produce carry. By using half adder, you can design simple addition with the help of logic gates.

1 Components

Component	Value	Quantity
bread board	-	1
led	-	2
Arduino	-	1
Jumper Wires	M-M	required number

Table 1:

2 Karnaugh-map

2.1 sum

		A	
		0	1
B	0	0	1
	1	1	0

Figure 1:k-map

From the above karnaugh-map the expression is

$$A'B + AB'$$

This karnaugh-map is verified by using Truthtable Table-1

2.2 carry

		A	
		0	1
B	0	0	0
	1	0	1

Figure 1:k-map

From the above karnaugh-map the expression is

$$A.B$$

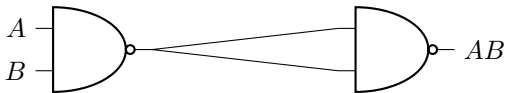
This karnaugh-map is verified by using Truthtable Table-1

3 half adder Truth Table

A	B	sum	carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Table 2:

4 Circuit Diagram

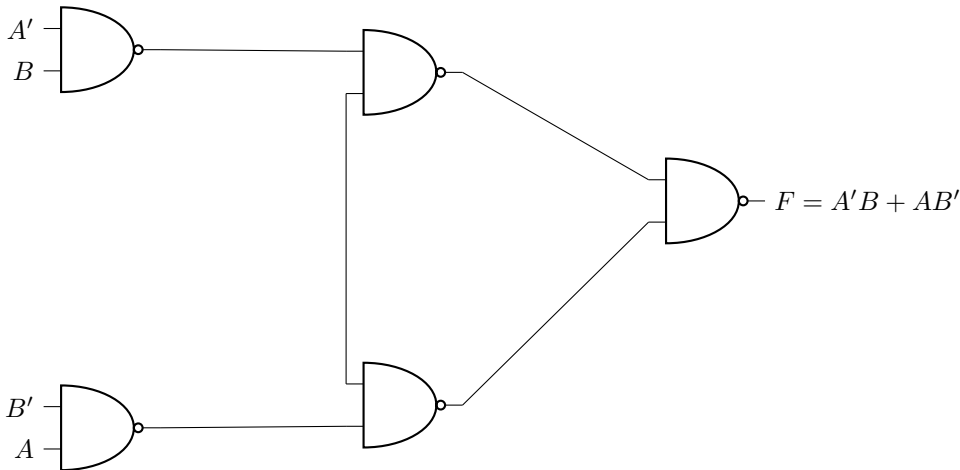


2.Download the following code

<https://github.com/Rameshrandhi/FWC-modulae1/blob/main/assign1/codes/assignment1.txt>

3.Upload the code into the arduino board.

4.The output '1' is represented as the state:'LED ON' and '0' is represented as the state 'LED OFF'



5 Hardware

Arduino	D2,D3	GND
Led1	+VE	-VE
Led2	+VE	-VE

Table 3:

6 Hardware Connection

Give the connections as per Table 3. For taking the inputs connect 5V of arduino to +ve line of bread board to consider it as logic 'HIGH'.Connect GND pin of arduino to -ve line of bread board to consider it as logic 'LOW'.

For example if the inputs A,B are connected 1,0 respectively the output should be sum=1 and carry=0 i.e., the LED connected to the 2nd pin should turn on and 3rd pin should turn off.

In the another case if we connect the inputs A,B to 1,1 respectively the output should be sum=0 and carry=1 i.e., the LED connected to 2nd pin should turn off and 3rd pin should glow.

The circuit implementation of the above function is given in figure 1.

7 Software

1.Connect the Arduino to the USB port of computer.