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Design of Half subtractor using NOR gates

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Abstract

Half Subtractor (HS) : Half subtractor is a combination circuit with two inputs and two outputs which is difference and borrow. It produces the difference between the two binary bits at the input and also produces an output (Borrow)

1 Components

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

Table 1:

2 Karnaugh-map

2.1 truth table

A	B	difference	borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Table 2:

2.2 Difference

B \ A	0	1
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 Truth Table2

2.3 Borrow

A \ B	0	1
0	0	1
1	0	0

Figure 2:k-map

From the above karnaugh-map the expression is A'B

This karnaugh-map is verified by using Truth Table2

3 Circuit Diagram

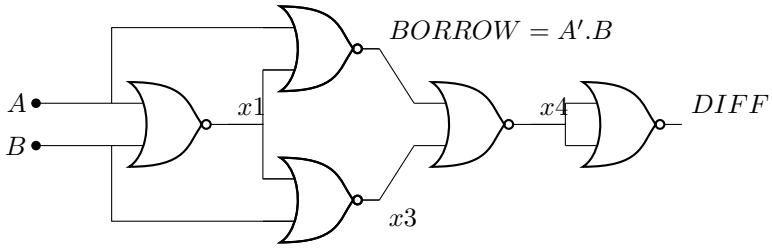

Figure2

4 Hardware

Arduino	D1,D2	GND
Led	+VE	-VE
Led	+VE	-VE

Table 3:

5 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 i.e., the LED connected to the 2pin should turn on.

In the another case if we connect the inputs A,B to

1,1 respectively the output should be 0 i.e., the LED connected to 3th pin should off.

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

6 Software

1.Connect the arduino to the USB port of computer

2.Download the follwing code

https://github.com/yogeeshreddy1/iithfwc/blob/main/assignment/hello.hex

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'