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UNIVERSITY OF INFORMATION TECHNOLOGY AND SCIENCES (UITS)

LAB REPORT : 7

IT-202 : DIGITAL LOGIC DESIGN LAB

Half Adder and Half Subtractor

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1 Abstrac

Half Adder A half adder is an adder which adds two binary digits together, resulting in a sum and a carry. ... Because this adder can only be used to add two binary digits, it cannot form a part of an adder circuit that can add two n-bit binary numbers.

Half Subtractor Quite similar to the half adder, a half subtractor subtracts two 1-bit binary numbers to give two outputs, difference and borrow. Since it neglects any borrow inputs and essentially performs half the function of a subtractor, it is known as the half subtractor.

2 Related Work

Inscert a truth table of Half Adder and Half Subtractor. So we can explain how its work.

2.1 Inserting Table Example

Presenting Half Adder and Half Subtractor in Truth Table 1.

A	B	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Figure 1:

2.2 Logical Expression:(K-Map)

From the above table, SUM is one when A=0 And B=1 Or (not and because A and B can have only one value at a time) when A=1 And B=0. So we can say that

SUM = $A'B + AB'$ which is equal to

$$\text{SUM} = A \oplus B$$

Half Adder : Sum = $A'B + AB' = A \oplus B$

Carry = AB

		A	
		0	1
B	0	0	1
	1	1	0

Figure 1: K-MAP FOR SUM

Figure 2:

		A	
		0	1
B	0	0	0
	1	0	1

Figure 2: K-MAP FOR CARRY

Half Subtractor :

$$\text{DIFF} = A'B + AB' = A \oplus B$$

$$\text{BORROW} = A'B$$

		A	
		0	1
B	0	0	1
	1	1	0

Figure 1: K-MAP FOR SUM

Figure 3:

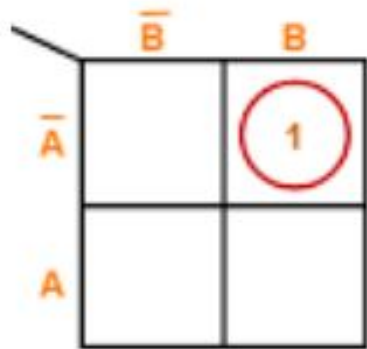


Figure 4: K-MAP FOR Borrow

Figure 4:

3 Methodology

3.1 Insert Image

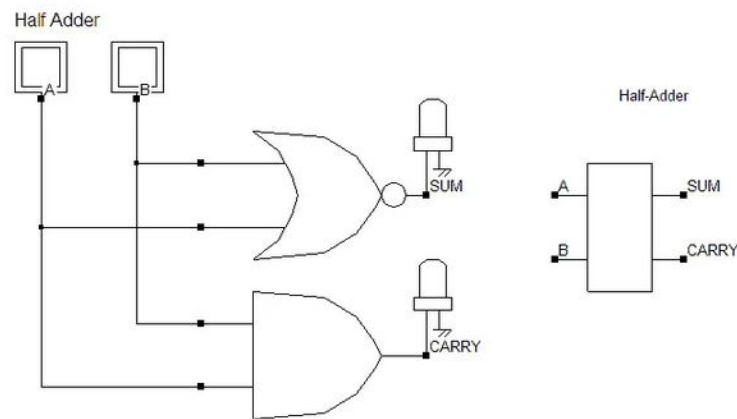


Figure 5: HALF ADDER

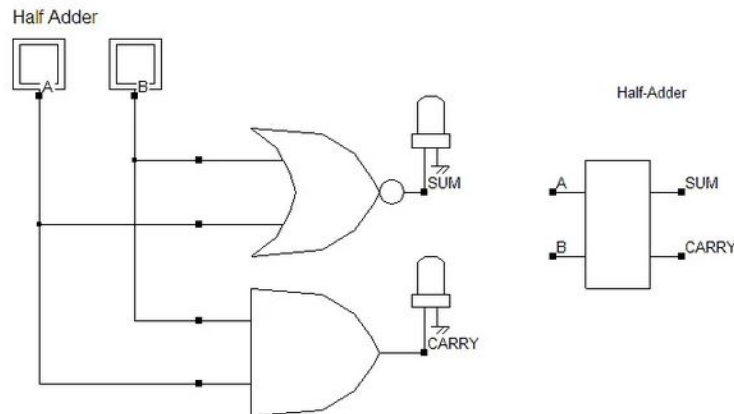


Figure 6: HALF SUBTRACTOR

3.2 Working Procedure

Lab Task: Procedur OF HALF ADDER

- Taking An XOR Gate(74LS86) An AND gate(7408) .
- Place it on bread board .
- Making Connections those materials on the breadboard.
- 'A' and 'B' are the input states, and 'sum' and 'carry' are the output states
- The carry output is 0 in case where both the inputs are not 1
- The least significant bit of the sum is defined by the 'sum' bit.
- Enter different output for check. .

Procedur OF HALF SUBTRACTOR

- Taking An XOR Gate(74LS86) A Not Gate(7404) An AND gate(7408)
- Place it on bread board .
- Making Connections those materials on the breadboard.
- 'A' and 'B' are the input variables whose values are going to be subtracted.
- 'Diff' and 'Borrow' are the variables whose values define the subtraction result i.e., difference and borrow
- Enter different output for check.

4 Results

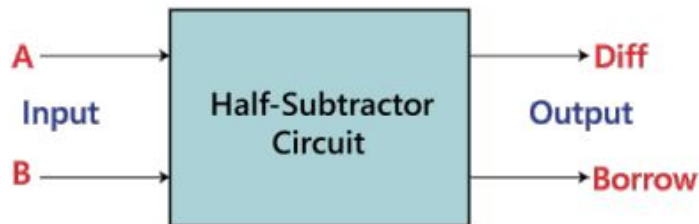
Output is shown in figure-3 for HALF ADDER.

4.1 Output-1

CIRCUIT IMAGE



Half Adder Block diagram



Half Subtractor Block diagram

5 Conclusion

The Half-Adder is a basic building block of adding two numbers as two inputs and produce out two outputs.

The half subtractor is also a building block for subtracting two binary numbers. It has two inputs and two outputs.

References

- 1.<https://www.electronics-tutorials.ws/logic/logic4.html>
- 2.<https://www.allaboutcircuits.com/textbook/digital/chpt-3/not-gate/>
- 3.<https://www.geeksforgeeks.com/textbook/digital/chpt-3/not-gate/>