North South University

Department of Electrical & Computer Engineering

Lab Report

Experiment No:	3
Experiment Title:	Design of a 4-bit by 4-bit Binary Multiplication Unit
Course Code:	**CSE332L**
Course Name:	**Computer Organization & Architecture Lab**
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Date of Experiment:	2/11/2021
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Objectives:

* Our objective in this experiment is to design a 4-bit by 4-bit Binary Multiplication Unit and understand how it works.

Equipments:

* 4 X 7408 AND IC
* 3 X 7483 or 74283 4-bit Adder IC
* Trainer Board
* Wires for connection

Block Diagram:

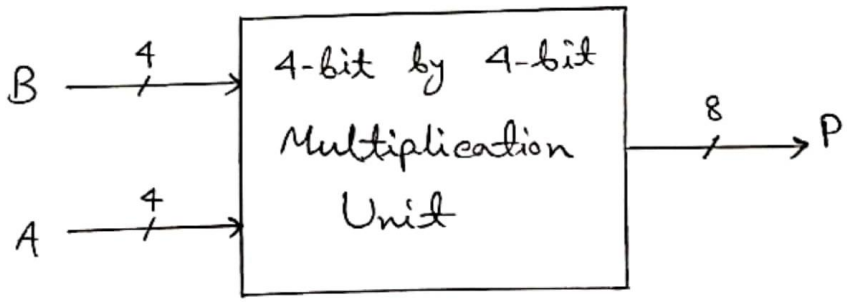

Figure - 1 : Block Diagram of a 4-bit by 4-bit Multiplication Unit

Table:

Multiplicand B4 B3 B2 B1				**Multiplier** A4 A3 A2 A1				**Product** S8 S7 S6 S5 S4 S3 S2 S1								**Result in Decimal**
1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	8×9=72
0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1×2=2
0	0	1	1	0	1	1	1	0	0	0	1	0	1	0	1	3×7=21
0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	4×8=32
0	1	0	1	0	1	1	0	0	0	0	1	1	1	1	0	5×6=30
1	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	9×4=36
1	1	1	1	1	0	1	1	1	0	1	0	0	1	0	1	15×11=165

Table: Experimental Results

Circuit Diagram:

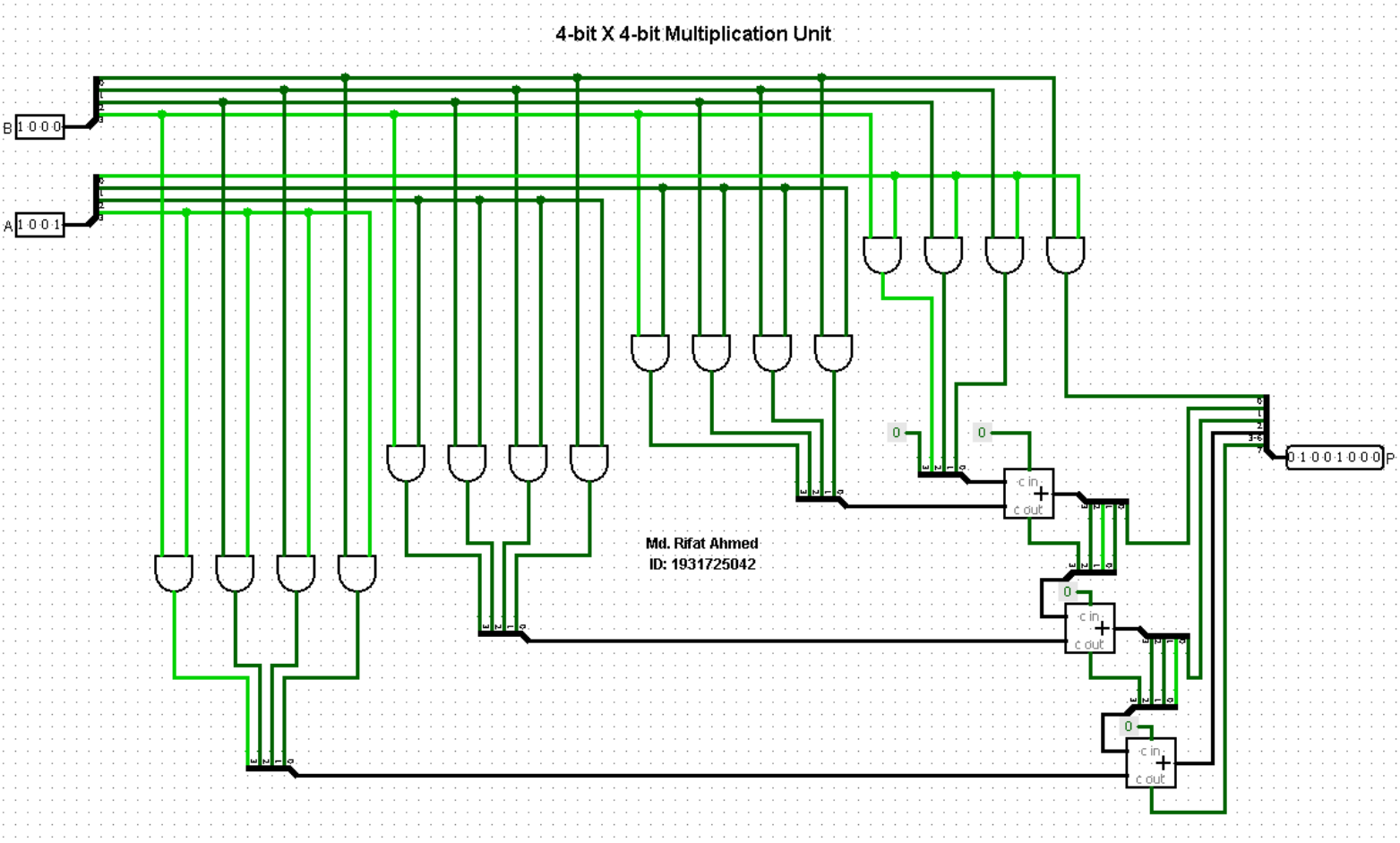

Figure – 2: Circuit diagram of a 4-bit by 4-bit Binary Multiplication Unit

Discussion!

In this experiment we learnt how to do Binary Multiplication then we also learnt how each steps work the designed the circ-cuit in Logisim using that knowledge. For a 4-bit by 4-bit multiplier we get 8-bit product and we do the multiplication here just like normal mathematics so we use AND gates as we're doing it for Binary numbers. Then we need 3 full adders with no carry in or we could say zero. We use these adders to do the calculations at the middle part. However in the first adder we send a zero as there's no 4th bit for the first input of the adder but the carry out goes as the 4th bit of the first input for the 2nd adder and it's the same process for the 3rd adder as well and then we got our result from the first AND gate A0B0 which is the least significant bit then

the least significant bit of the result of 1st and 2nd adder then the result of the 3rd adder and finally the carry out from the 3rd adder as the most significant bit of the product. Then we used a splitter to show these 8-bits as a single result and that's how we did the multiplication of 4-bit by 4-bit and got an 8-bit product.