North South University

ECE

Experiment No: 3
Experiment Title: Design a 4-bit by 4-bit Binary Multiplication Unit
Course Code: CSE332L
Course Name: Computer Organization & Architecture Lab

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Objective:

- Here we learn how to create a 4-bit by 4-bit Binary Multiplication Unit
- Understanding its theory and implementation
- Checking if the multiplication works and showing the output

Apparatus:

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

Block Diagram:

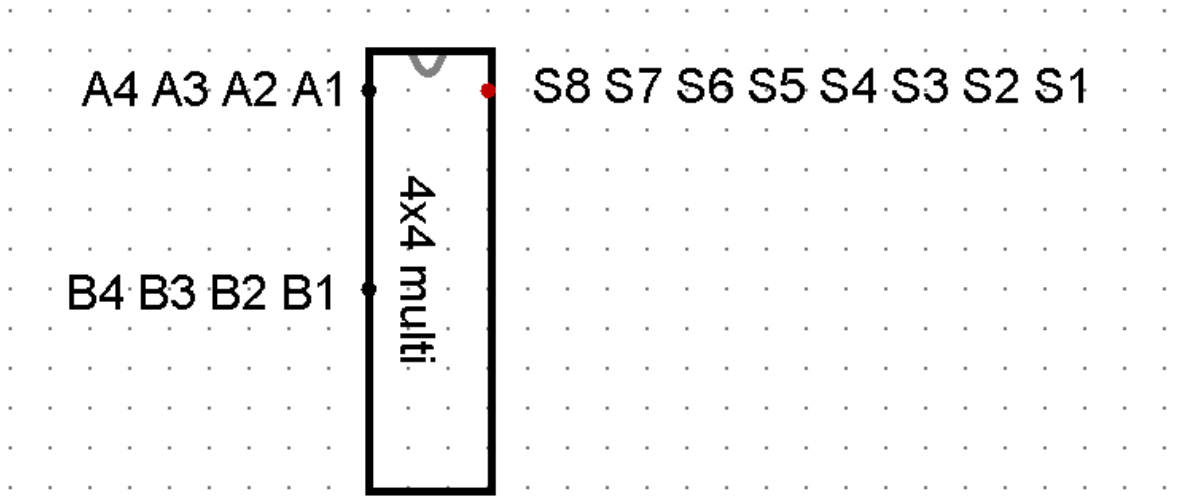

Fig-1: 4-bit by 4-bit Binary Multiplication Unit (block Diagram)

Truth Table:

Theoretical

Multiplicand				Multiplier				Product										Theoretical
B4	B3	B2	B1	A4	A3	A2	A1	S 8	S7	S6	S5	S4	S3	S2	S1	B	A	Result in Decimal
1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	8	9	72
0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	5	2	10
0	1	1	1	0	0	1	1	0	0	0	1	0	1	0	1	7	3	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

Experimental

Multiplicand				Multiplier				Product										Experimental
B4	B3	B2	B1	A4	A3	A2	A1	S 8	S7	S6	S5	S4	S3	S2	S1	B	A	Result in Decimal
1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	8	9	72
0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	5	2	10
0	1	1	1	0	0	1	1	0	0	0	1	0	1	0	1	7	3	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

Circuit diagram:

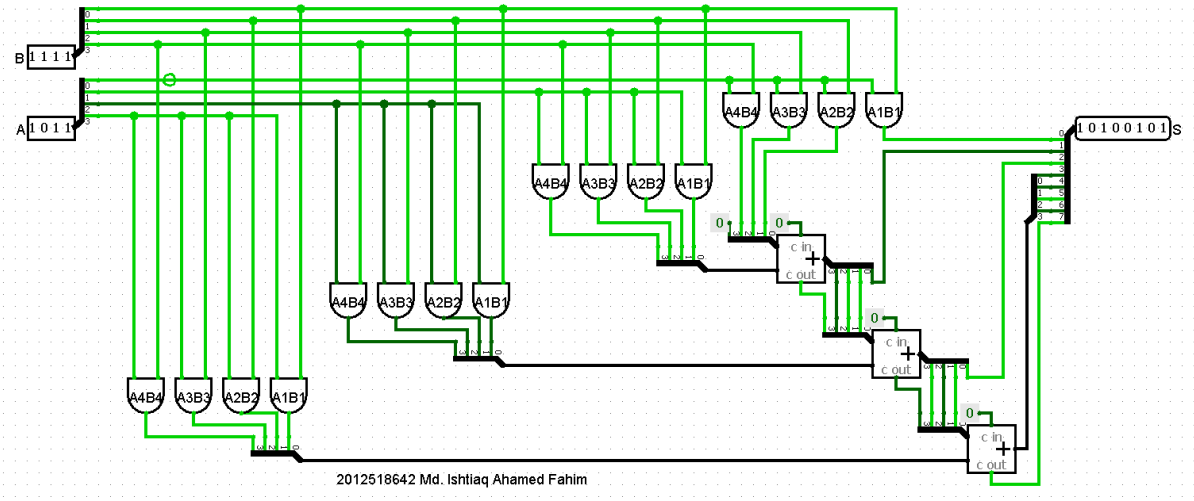

Fig-2: 4-bit by 4-bit Binary Multiplication Unit (Circuit diagram)

Discussion:

We learned how to create a 4-bit by 4-bit Binary Multiplication Unit with full adder and understand the inner workings of the circuit. We also tried to create it with 1 bit by 1 bit multiplication unit, with resulted badly. Furthermore, we simulated pen and paper mode multiplication with the help of logisim software.