North South University

Department of Electrical & Computer Engineering

Lab Report

Experiment No:	2
Experiment Title:	Design a 4-bit by 4-bit Binary Multiplication Unit
Course Code:	**CSE332L**
Course Name:	**Computer Organization & Architecture Lab**
Name & ID:	Nawal Ayesha Khan, 1911301042
Date of Experiment:	10.3.2021
Date of Submission:	10.3.2021

★ Objectives

- Understanding behaviour of computational multiplier designed as part of the experiment.
- Understanding the theory and implementing multiplication unit.
- Check multiplying bits and show sum outputs.

★ Equipment:

- 4 × 7408 AND IC
- 3 × 7483 4-bit Adder IC
- Trainer board
- Wires

★ Block diagram:

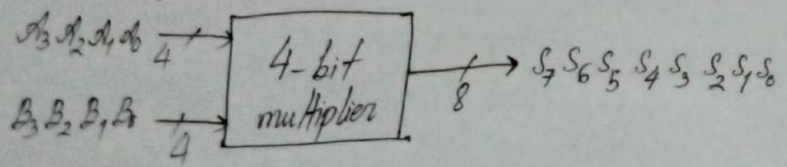


Fig 1: Block diagram for 4×4 bit multiplier circuit

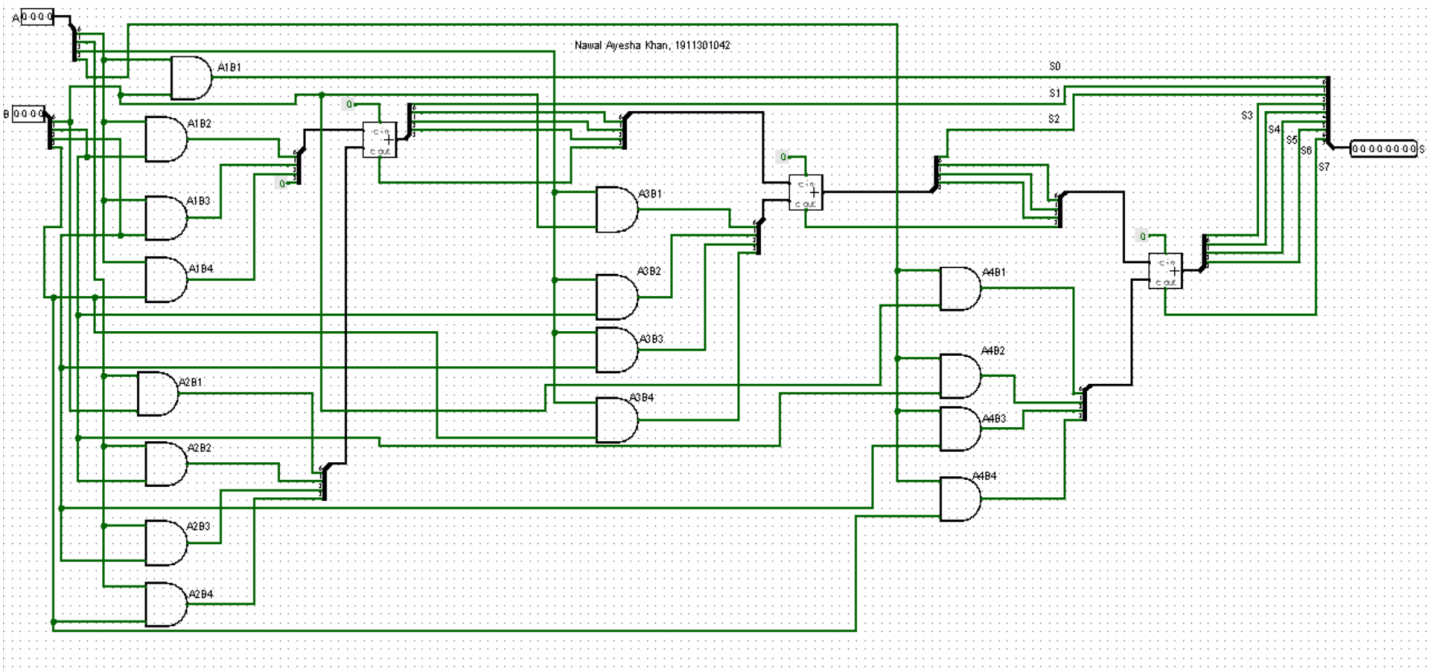
☆ Truth table:

Multiplicand B4 B3 B2 B1	Multiplier N4 N3 N2 N1	Product S8 S7 S6 S5 S4 S3 S2 S1	Results 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 × 8 = 72
1 1 1 1	1 0 1 1	1 0 1 0 0 1 0 1	15 × 11 = 165

Table: Truth table for experimental values of product of multiplication

Circuit diagram:

Fig 2: Circuit diagram of 4-bit binary multiplier



* Discussion: In this experiment, we learned about the 4-bit multiplier using 4-bit adders and AND gates. We tested the inputs and validated them using the truth table. AND IC is used to multiply individual bits of the inputs, and the 4-bit adder are used to add the partial products. Outputs are connected to inputs of next 4-bit adders to sum up the partial products. The ICs are placed on a trainer board, and test the experiment using input switches and output LEDs. Multiple input combinations are applied and outputs are observed and verified according to the truth table. As the outputs match the theoretical ones in the table, the multiplier works as designed, and the experiment is successful.