CSE332 Lab 3

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Course: CSE332L
Section: 3
Experiment Name: Design of a 4-bit Binary Multiplication Unit

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Table:

Multiplicand **A1 A2 A3 A4**	**Multiplier** **B1 B2 B3 B4**	**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 1 0 1	0 0 1 0	0 0 0 0 1 0 1 0	5 x 2 = 10
0 1 1 1	0 0 1 1	0 0 0 1 0 1 0 1	7 x 3 = 21
0 1 0 0	1 0 0 0	0 0 1 0 0 0 0 0	4 x 8 = 32
0 1 0 1	0 1 1 0	0 0 0 1 1 1 1 0	5 x 6 = 30
1 0 0 1	0 1 0 0	0 0 1 0 0 1 0 0	9 x 4 = 36
1 1 1 1	1 0 1 1	1 0 1 0 0 1 0 1	15 x 11 = 165

Discussion: In our third lab class our goal was to design a 4-bit binary multiplication unit. A 4-bit binary multiplication unit was designed in Logisim. How multiplications for binary numbers are done was explained with details. In a combinational multiplier to multiply two 4-bit binary numbers, the output bits will be 8 or less.

To design a combinational multiplier to multiply two 4-bit binary numbers we need sixteen AND gates and three 4-bit Adder. In the implemented multiplier A0, A1, A2 and A3 were used as multiplicand input and B0, B1, B2 and B3 were used as multiplier input. Each bit of the multiplier is multiplied against the multiplicand, the product is aligned according to the position of the bit within the multiplier, and the resulting products are then summed to form the final result. At the end we are given a task to implement the complete 4-bit binary multiplication unit using Logisim.