Computer Logic 1

Lab 2 - Deliverable

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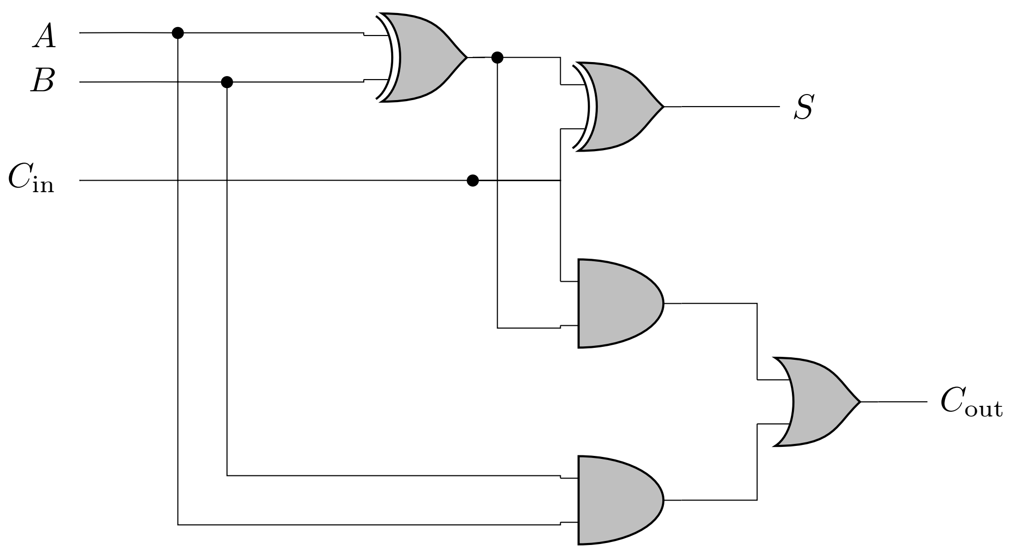
Truth Table and Schematic

Below are the worked out values of the truth table for the boolean expressions

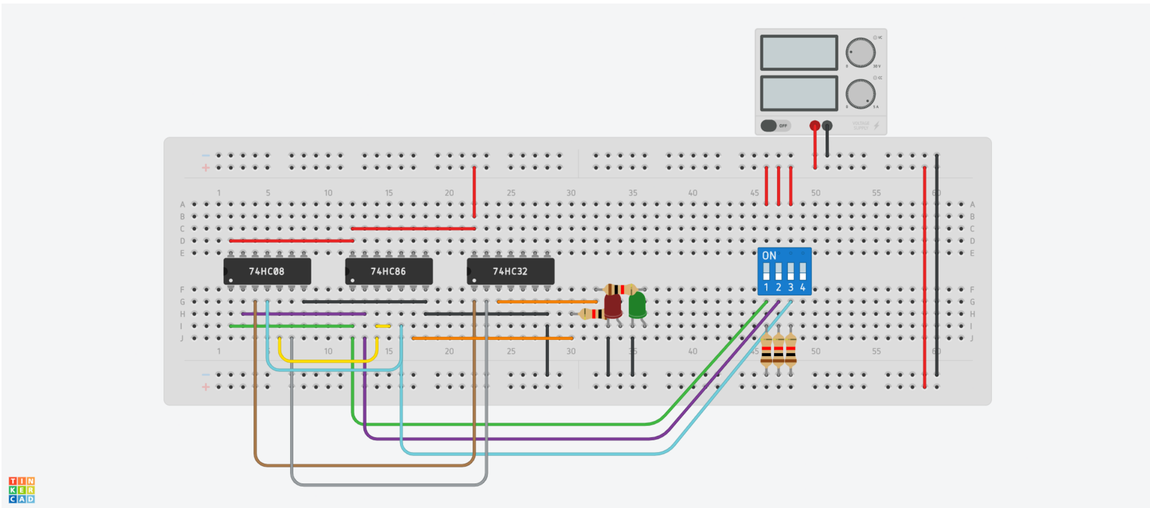
$$S = (A \oplus B) \oplus C_{\text{in}}$$
$$C_{\text{out}} = A \cdot B + C_{\text{in}} \cdot (A \oplus B)$$

and its representation in a schematic using logic gates.

A	B	C_{in}	S	C_{out}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1



Tinkercad Schematic



My breadboard setup for this lab session.

All possible input combinations

It is to be noted that the **red LED** stands for the S bit (*the sum bit*) and that the **green LED** stands for the C_{out} bit (*the carry bit*). A more intuitive view of binary addition through this 1-bit full adder could have been achieved by arranging the C_{out} LED before the S LED (*opposite of what is portrayed in pictures hereunder*).

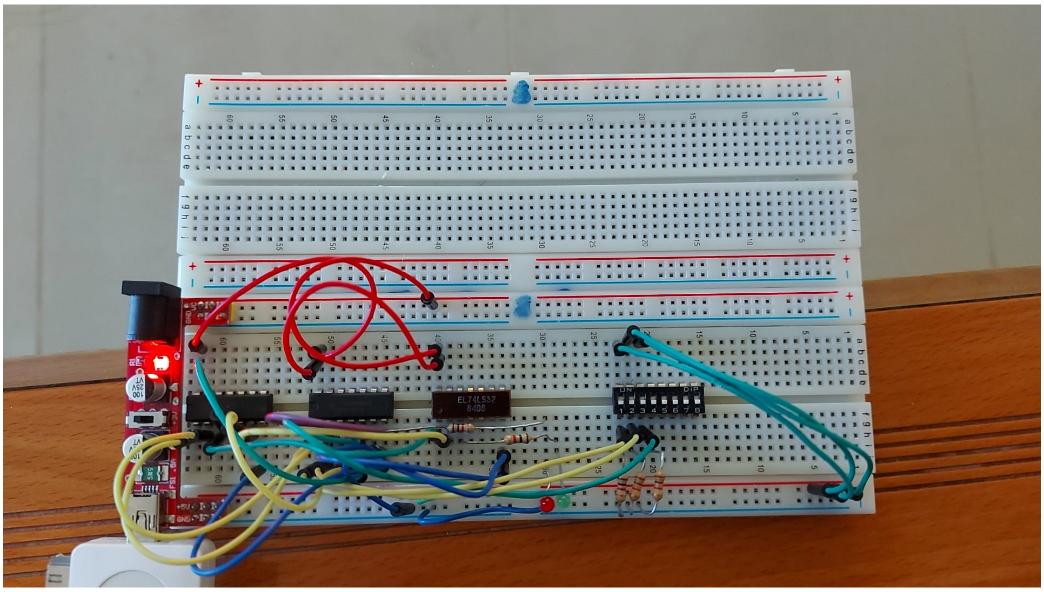


Figure 1. All switches are off. $A = 0$, $B = 0$, $C_{in} = 0$ and so $S = 0$, $C_{out} = 0$.

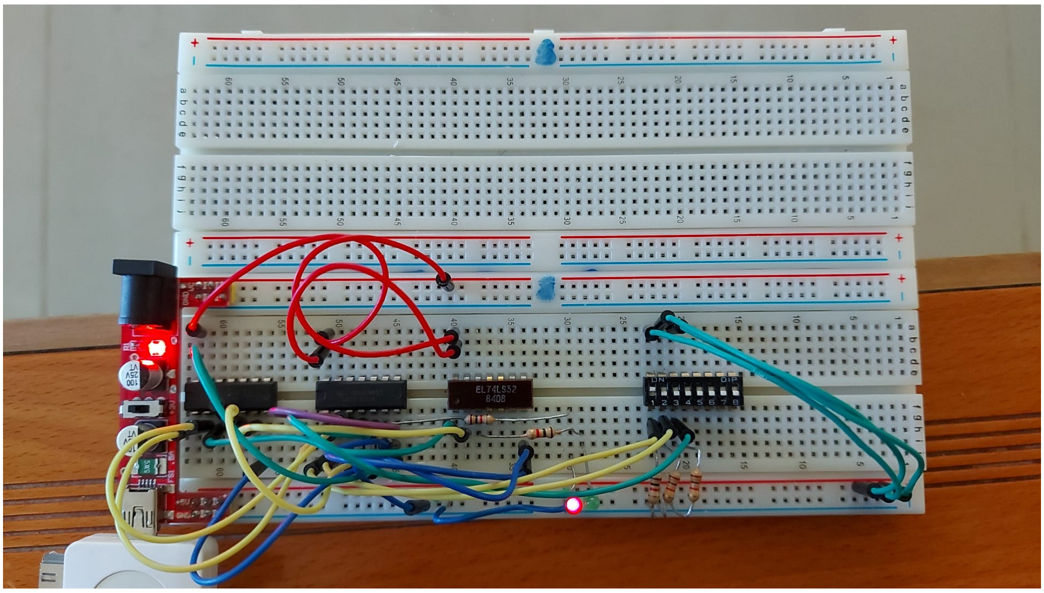


Figure 2. Only switch 1 is on. $A = 1$, $B = 0$, $C_{in} = 0$ and so $S = 1$, $C_{out} = 0$.

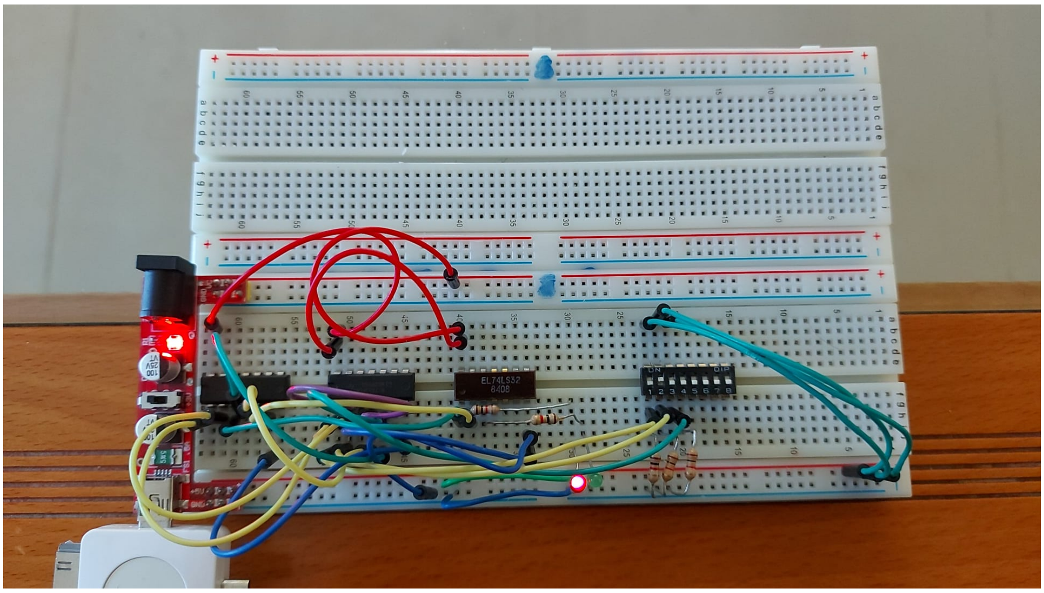


Figure 3. Only switch 2 is on. $A = 0$, $B = 1$, $C_{in} = 0$ and so $S = 1$, $C_{out} = 0$.

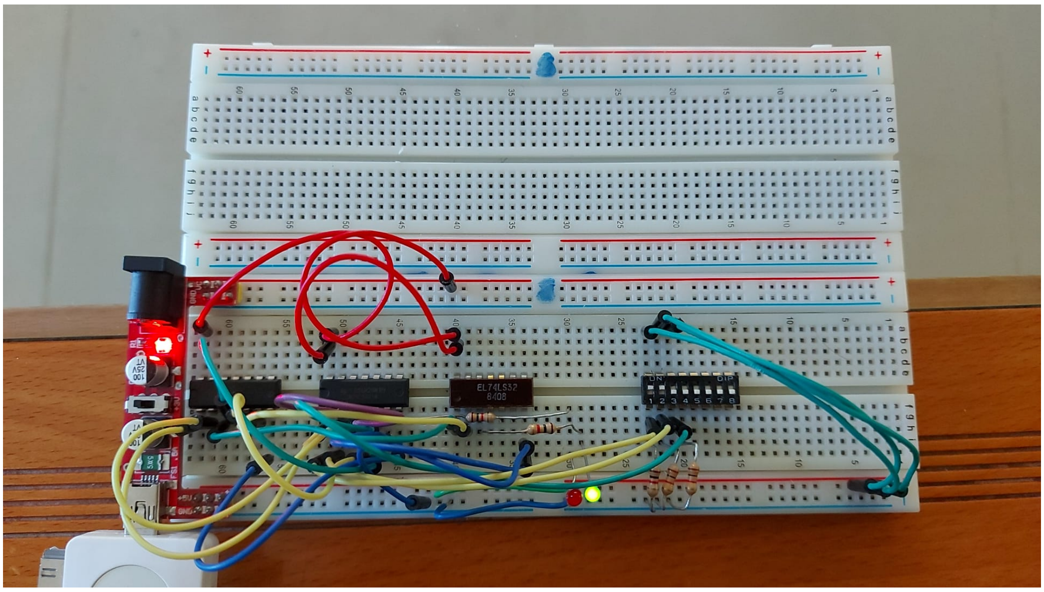


Figure 4. Only switches 1 and 2 are on. $A = 1$, $B = 1$, $C_{in} = 0$ and so $S = 0$, $C_{out} = 1$.

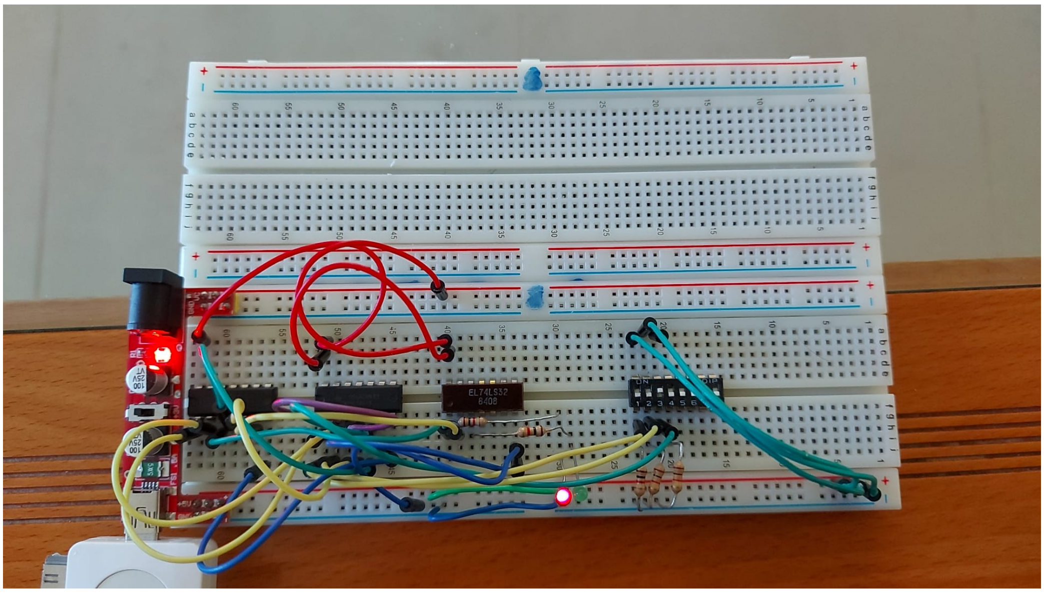


Figure 5. Only switch 3 is on. $A = 0$, $B = 0$, $C_{in} = 1$ and so $S = 1$, $C_{out} = 0$.

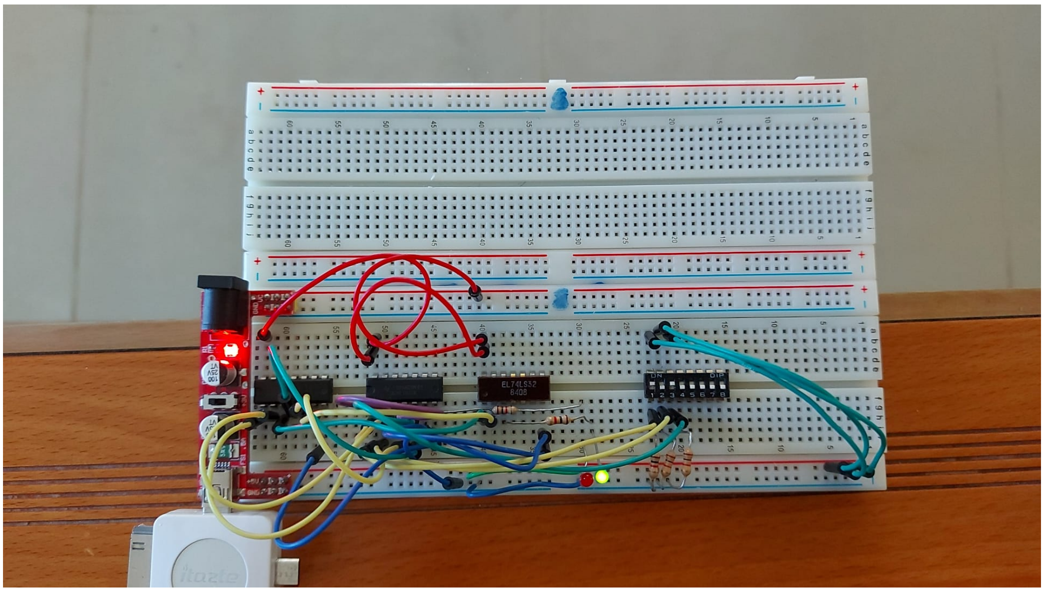


Figure 6. Only switch 1 and 3 are on. $A = 1$, $B = 0$, $C_{in} = 1$ and so $S = 0$, $C_{out} = 1$.

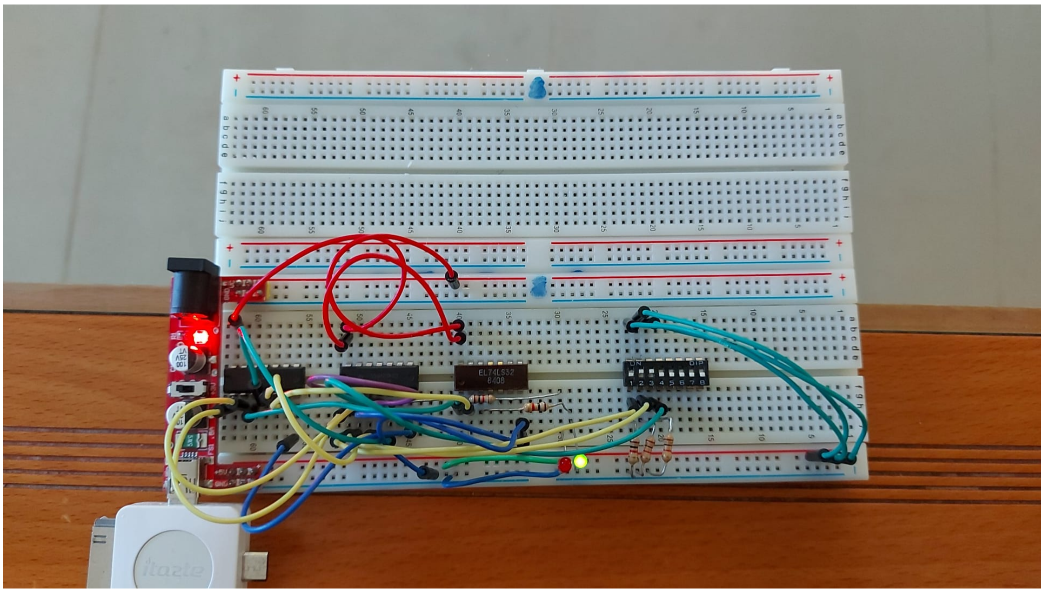


Figure 7. Only switches 2 and 3 are on. $A = 0$, $B = 1$, $C_{in} = 1$ and so $S = 0$, $C_{out} = 1$.

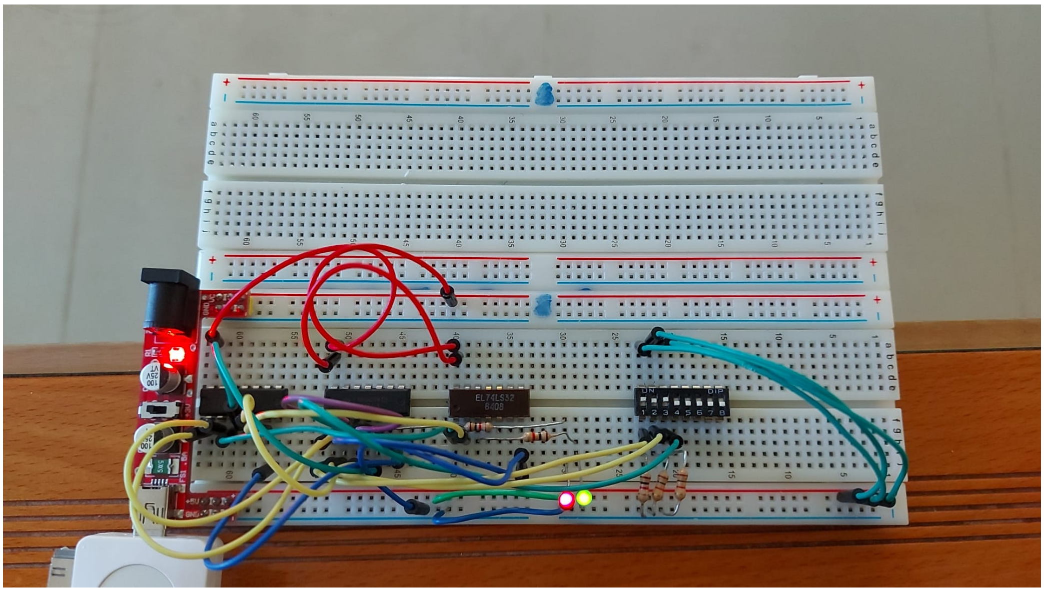


Figure 8. All switches are on. $A = 1$, $B = 1$, $C_{in} = 1$ and so $S = 1$, $C_{out} = 1$.