Lab1 Report

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Expected result:

Input		Output	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

If both inputs are switched off, both LEDs should be off.
If one of the inputs is switched on, LED connected to XOR gate should be on.
If both inputs are switched on, LED connected to AND gate should be on.

Result:
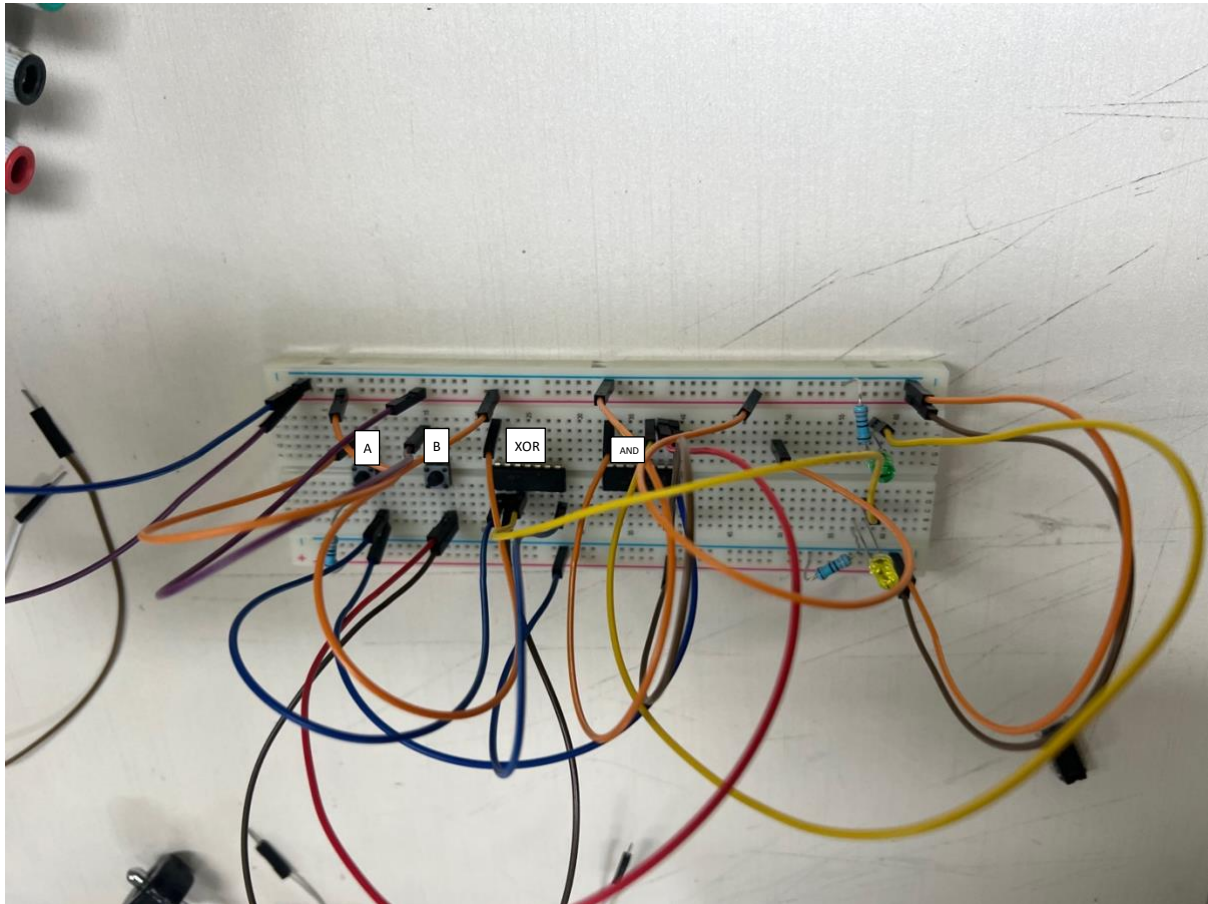
Both LEDs did not switch on for all four input combinations.

Discussion:
During the lab session, we were able to learn the mechanism of the breadboard. At each side of the board with plus or negative signs, the holes are linked vertically. And in the middle, holes are connected horizontally, but not through the divider in the middle. We learned that resistors must be used to prevent excessive current flow to the LEDs. We also learned that when using switches, the input can 'float' randomly when the switch is open, and pull-up / pull-down resistors can be used to avoid it. Moreover, we learned how to operate the power supply.

With what we learned in the lecture, we were able to construct a circuit on the breadboard, and supply power to it. We were able to build a circuit that should theoretically take two inputs, pass both of them through each of the XOR and AND gate, and pass the output to each LED, which each served as a sum and a carry, combined to work as a half-adder.

However, the completed circuit did not give the desired result. Instead, the LEDs both stayed off regardless of the output. We re-examined the circuit, and confirmed that the implemenation is logically correct (also checked by TA during lab session). And the LED was turned on when we tried forming a simpler circuit without switches and gates. So the reason the circuit did not function as expected is suspected to be one or more of the following:

1. Faulty jumper wires
- Forming the half-adder circuit required more jumper wires than the simpler circuit which worked. Therefore, there is a chance that a faulty wire was included in the circuit.

2. Faulty holes in the breadboard
- Because more jumper wires were used, more holes in the breadboards were used. It might be the case that one or more holes to which the jumper wires connected were not operating were faulty.

To be able to correctly locate the cause of the malfunction, more testing could have been carried out before constructing the circuit. For example, we can test each jumper wire that will be used with a simpler circuit with only a LED and a resistor, and check that the LED turns on correctly. Similarly, we can test that the holes in the breadboard works correctly by connecting each hole to form a simpler circuit. We can form this simple circuit multiple times with different wires and the same holes, and then with the same wires and different holes to check if they function correctly.