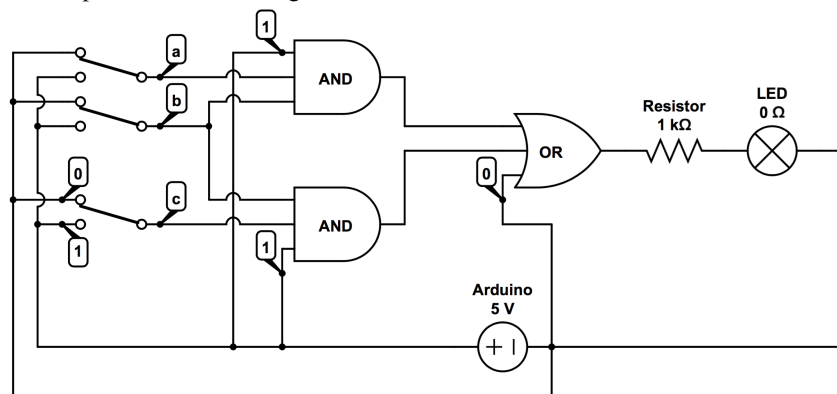## 6.1   Experiment 1 (Hardware Implementation of a Combinational Circuit)

6.1.1   Aim

In this experiment, your knowledge about the working principles of the combinatorial logic gates which is explained in section 2.4 of the course book will be tested.

6.1.2   Problem

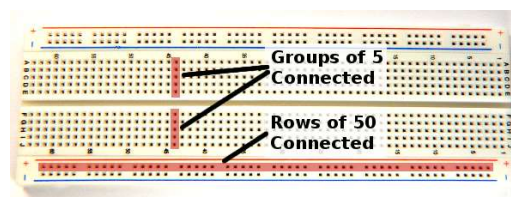You will implement the following circuit on a breadboard.

6.1.3   Preliminary Work

Before the experiment, you should study the working principles of all circuit components described below.
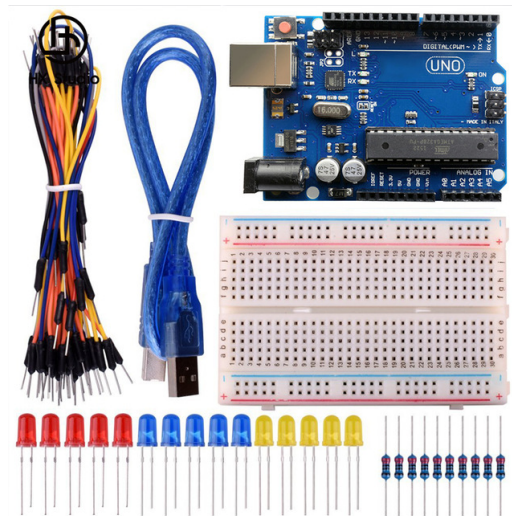
BreadBoard

To understand breadboards, we recommend you to watch the video tutorial at
`https://youtu.be/fq6U5Y14oM4`

A breadboard is a board on which you can put circuit components and connections. There are two rows at the top and two rows at the bottom. These rows are power rails and each row is internally connected, i.e. they will always have the same voltage. Rows
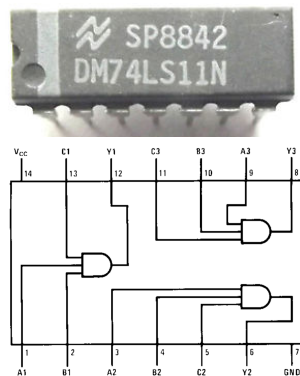
with plus sign (+) expect a positive voltage source. Rows with minus sign (-) expect a negative voltage source. In the middle, there are 63 columns and 10 rows. Each of these columns is internally connected but divided by a center divider. We put chips s.t. one side of the chip is connected to one side of the center divider and the other side of the chip is connected to the other side of the center divider.
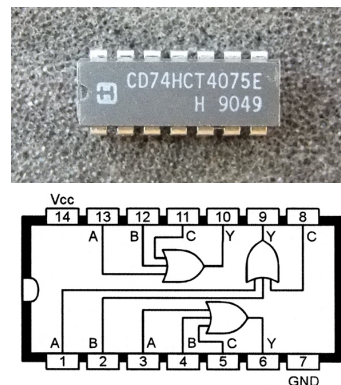

Along with the breadboard, we provide one Arduino as a $5V$ power source, and one USB cable to power the Arduino. We also provide sufficient amount of connector cables/wires, LED lamps, switches, and $1k\Omega$ resistors. Finally, we provide one AND gate and one OR gate. We show the diagrams of these gates below.

3-input AND Gate (74LS11N)   **3-input OR Gate (74HCT4075E)**

6.1.4   Lab Work

1. Request one Arduino, one USB connector, one 74LS11N chip, one 74HCT4075E chip, one resistor, one led lamp, three switches, and 30 connector cables/wires.

2. Implement and then demonstrate to the assistants the circuit on the breadboard.

3. Answer the questions on the lab sheet.