microLab Second Exercise

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Question 4 :

The main difference is that the internal oscillator is usually an RC-type oscillator which is not very accurate. External oscillators can be more accurate.

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a constant frequency. This frequency is often used to create a square wave to provide the clock source for devices. External crystal oscillator should be used when accurate frequency of operation is desired, whereas if no time critical operation is present in the system, the internal RC oscillator is the best option. Many AVRs (like ATmega8, ATmega16, ATmega32) have internal RC oscillator. It is calibrated for 1,2,4 or 8MHz. It has ±3% accuracy. Frequency of oscillator gets affected by VCC and temperature.

Question 5 :

One important issue that pins of microcontrollers have is floating inputs which mean they have random voltage or value (0,1) so to solve this problem we can use pull-ups for having High voltage (1) & low voltage (0) for pins.

We can use the bottom circuit to have a pull-up: But when a,b connect we get a short circuit between Ground & Vcc that makes a big current and it makes heat. To solve this problem we use a resistor to prevent the high

To calculate minimum R for this can use its formula

R(min): This means minimum pull up resistor

V(cc): is the supply voltage

IOL & VOL: this comes from a logical - voltage diagram.

Also, we can have a capacitor to have a delay to pull-up we use it for the Reset pin. We can use the top formula to calculate the time of capacity charge. How to calculate a pull-up resistor? From reference I get these bottom tips: 1. 1kΩ to 10kΩ for general purposes. (10k is preferred) 2. 10kΩ to 100kΩ if you have a low-power use case such as a device that is battery powered