262 - LAB 2
LED Scrolling Pattern with Input

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COURSE DATE & TIME: 10/01/21 @9:00AM

OBJECTIVE:

To generate a pattern on the LEDs that scrolls to the right or left at a slow enough rate to be visually perceptible, The speed is to be determined by the push button

To become familiar with the 4 ports of the 8051, reading digital input from a switch/pushbutton and writing digital output to drive 8 LEDs.

OPERATION:

A pattern of 0x01 should scroll from right to left and once the single lit led reaches the left side it should shift in the other direction. In other words, only one led should be on at any time and it should appear as though this led is moving either to the left or right. The scrolling should continue to repeat indefinitely. The speed should be determined by the state of the onboard pushbutton/switch. When the pushbutton is not pushed, it should appear to be a slow movement, approx. 1 sec per move. When the button is held down the speed of movement should be much faster, approx. 0.5 sec per mov.

THEORY:

One pin of P0 takes a binary input from the on-board pushbutton/switch while all 8 pins of P1 drive the LEDs. The datasheet/usermanual/schematic of the development board will help you find which pin of P0 is connected to the switch/pushbutton. Scrolling can be achieved using a logical right or left shift. All shifting should be accomplished using for loops, i.e. you may not hard code each output to the LEDs individually. A delay loop (busy wait) will have to be written in order to slow down the scrolling of the LEDs to be perceptible to the human eye.

LAB WRITE-UP:

The lab write-up will include this page as the cover sheet and all materials in one document submitted on beachboard dropbox.

Any questions answered

A schematic properly done in a professional grade schematic entry tool like CircuitMaker.

The source code

A picture of your physical prototype.

Schematic: A schematic should be drawn to show 3 things. The 8 LEDs interfaced to Port 1 and the switch/pushbutton with all necessary circuitry connected to the 8051 along with power for the 8051.

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DEMO:

When your project is ready, you will demonstrate the functionality to the instructor.

QUESTIONS:

How are the LEDs interfaced to Port 1 of the 8051? Hint: (Just write a description in a few sentences of how the 8051 is driving the LEDs, what are the values being used to turn the LED on or off, etc…)

ANSWER: Our 8 LEDs are interfaced to Port 1 of the 8051. This is done because in each port (port 1, 2, etc.) has a register of 8 bits. Each LED is being driven by these 8 bits (P1.0, P1.1, . . . , P1.7). Within the register, each of the 8bits can hold 2 states. A high "1" means you have a closed switch whereas a low "0" means you have an open switch. These bits are then driven into an inverter which will determine if the switch is open or closed. If closed LED is on, if open LED is off.

How is the switch/pushbutton interfaced to the pin of P0 of the 8051? Hint: (Just write a description in a few sentences of how the 8051 port is being driven. What are the values read depending on the position of the switch/pushbutton, etc..)

ANSWER: The switch/pushbutton is interfaced to the pin of P0 of the 8051 by sending a binary value of 0/1, 0 is not being pressed, whereas 1 is being pressed. The binary value of 0 explicates false, whereas the value of 1 is true. After the binary value is determined, our code proceeds to run its designated condition. In our lab, we have a default speed when the button is not being pressed and a faster speed when it is pressed.

Does the 8051 Sink or Source current when the LED is "On"?

ANSWER: Source

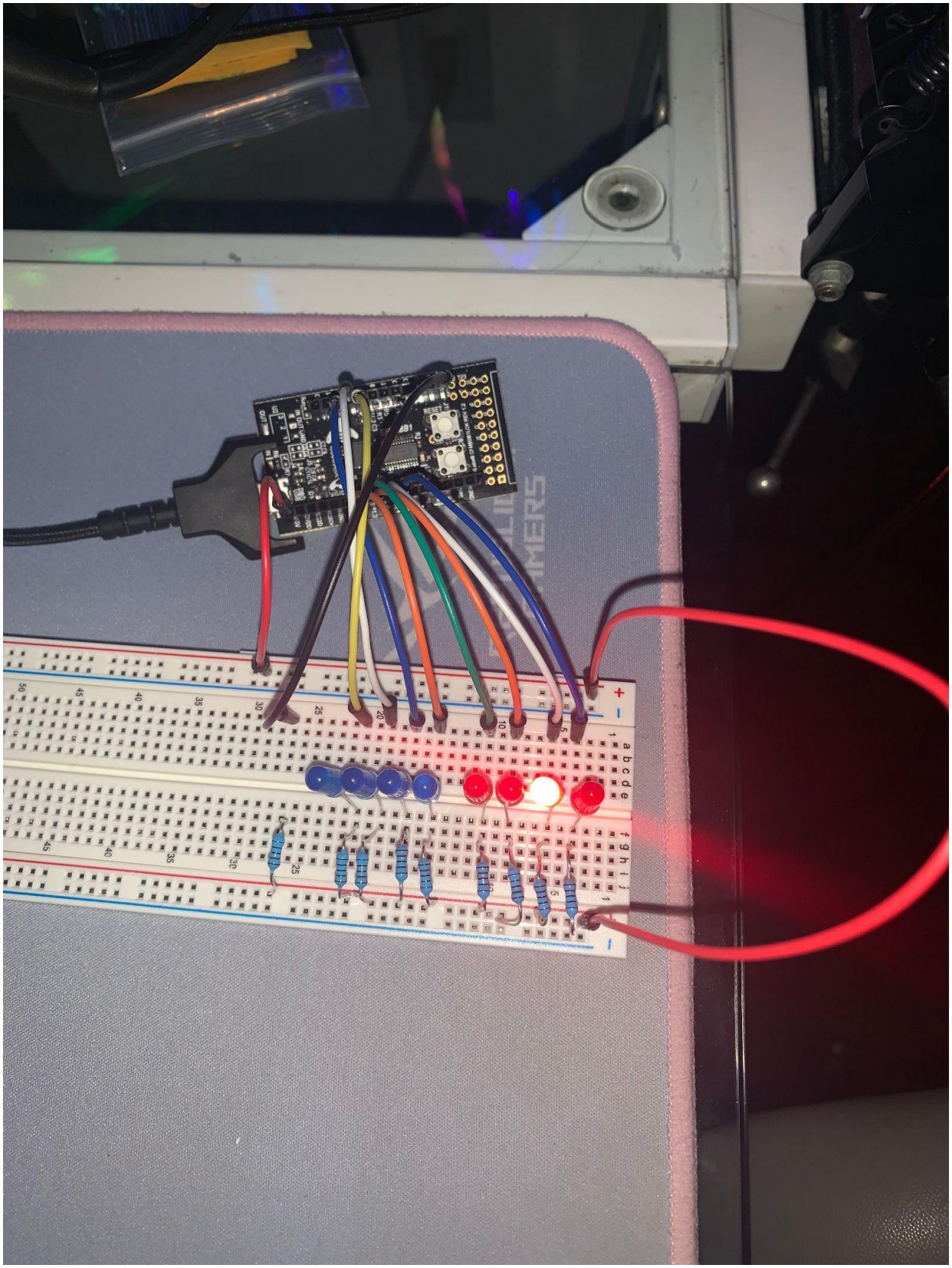
What size (how many ohms) is the current limiting resistor for each LED, show this work and calculation?

ANSWER: 1k ohms

How much current is the LED being driven with? Use The Typical Vf (1.8v) for a general purpose LED. This and the value of the current limiting resistor found earlier will allow you to calculate the current.

ANSWER: $V = IR \Rightarrow I = V / R \Rightarrow (5V - 1.8V) / (1k) = 0.0032mA$

Physical Prototype



Hand Drawn Schematic