ECE 204L - THE VERY BASICS - LAB 1
INTRODUCTION TO SWITCHING CIRCUITS - PART I

WINTER 2004 **A.P. FELZER**

OBJECTIVE

The objective of this lab is to learn how to build simple switching circuits.

LAB

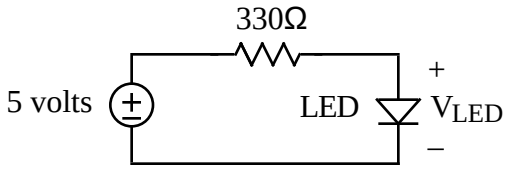
1. **Prelab** - Wire the buses on your protoboard with red for 5 volts and black or a dark color for ground. Then draw a picture to illustrate what you did

2. **Prelab** - How can an ohmmeter be used to determine if two points on a protoboard are connected

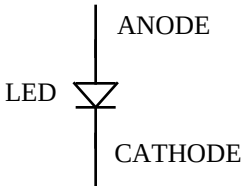
3. Before you connect the power use an ohmmeter to verify that
   a. The 5 volt and ground buses are not shorted together
   b. The 5 volt bus is connected to the red 5 volt post
   c. The ground bus is connected to the black ground post

4. Connect and turn on the power and then make use of a voltmeter to verify that
   a. The 5 volt bus really is at 5 volts
   b. The ground bus really is at ground

5. The objective of this problem is to figure out which way to connect the LED (Light Emitting Diode) in the following circuit so that it lights up

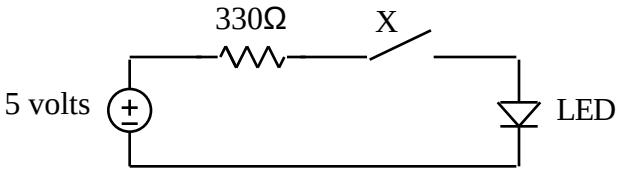


   Note that the anode and cathode sides of an LED are as follows



   a. Draw a copy of the circuit for your lab report and then build the circuit so the LED is ON. Note that the purpose of the resistor is to prevent the voltage across the LED from getting too large.
   b. Make use of your result in part (a) to describe how to hook up an LED so it lights up - or equivalently how to tell which side is the anode. **Memorize** this result.
   c. Measure the voltage across the LED when it's ON

6. Given the following switching circuit

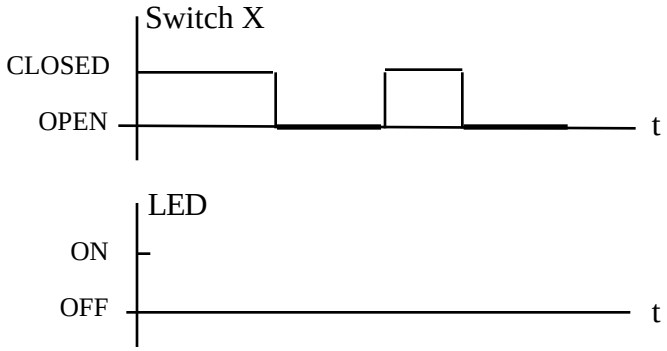


with a single-pole single-throw switch X

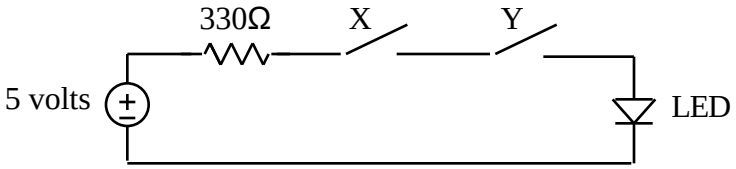
a. Draw a copy of the circuit diagram for your lab report and then build the circuit
b. Open and close the switch to see when the LED is ON and when it's OFF. Then make use of your results to complete the following truth table

X	**LED**
OPEN	
CLOSE	

c. Open and close the switch in your circuit to complete the following timing diagram



7. Given the following switching circuit



a. Draw a copy of the circuit diagram for your lab report and then build the circuit
b. Open and close the switches to see when the LED is ON and when it's OFF. Then make use of your results to complete the following truth table of the circuit

X	**Y**	**LED**
OPEN	OPEN	
OPEN	CLOSE	
⋮		

c. Make use of your truth table in part (b) to draw a representative timing diagram of the circuit

8. Make up your own switching circuit with at least two switches
   a. Draw a circuit diagram of your circuit and then build it
   b. Open and close the switches to see when the LED is ON and when it's OFF. Then make use of your results to obtain the truth table of your circuit