

## ENGR1202 – Computer Engineering Assignment – Robotics and Control – Fall 2013

### Assignment 1 – Bread-boarding Lab Exercise

You will follow the bread-boarding lab exercise procedure below. Once you have run the exercise, demonstrate Circuit #8 to the lab TA and hand him the Lab Checkout sheet.

After you demonstrate the lab, write a short lab report (one page is fine). Submit **ONE pdf document** per group – upload it to Moodle. Make sure to include the group participant names in the document. Spelling and grammar COUNT in this graded assignment. Name the document:

ENGR1202-Assignment1-lastname1-lastname2.pdf  
where lastname1 and lastname2 are the last names of the lab partners.

You can use the space in EPIC 2130/2132 for this lab work.

#### Materials needed:

- Breadboard (you provide)
- Jumper wires (you provide)
- 2-AA batteries (you provide)
- Battery holder (we provide, will be used for final project)
- QTI sensor (we provide, will be used for final project)
- 2N2222 transistor (we provide, will be used for other labs)
- 4 LEDs (2 of 2 different colors) (we provide, will be used for other labs)
- 4 resistors 1kOhm,  $\frac{1}{4}W$  (we provide, will be used for other labs)

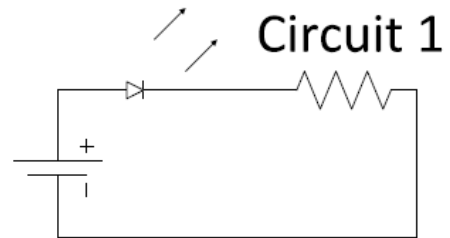
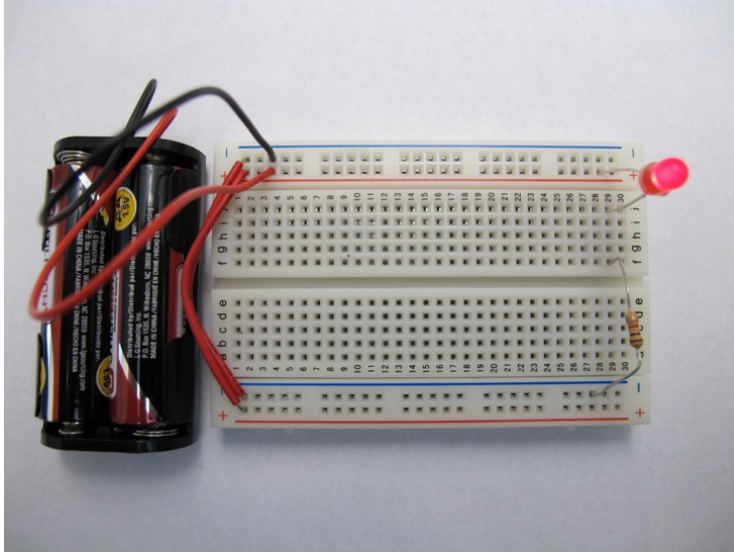
#### Objective of lab

In this lab exercise you will build eight different circuits and record the results of each circuit you build using the materials listed above. Your group must show/demonstrate the final circuit and answer any questions the TA has. During the lab check-out, hand in the lab check out form (include your names on it!).

### Circuit 1

Build Circuit 1 (shown in the photo and schematic). Note that the long leg of the LED is inserted on the + side of the battery. Notice the intensity of the LED, since it will be used as the basis of observations later. Answer the question:

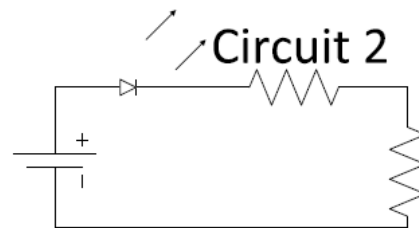
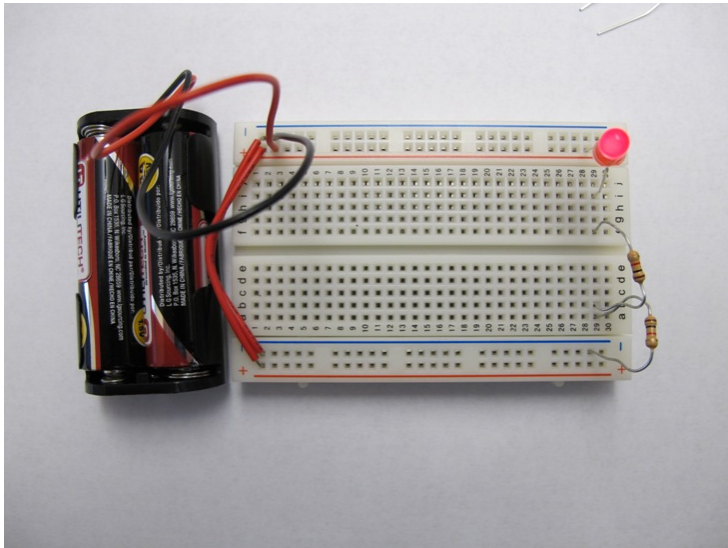
1. What is the theoretical current through the LED of this circuit?



### Circuit 2

Build Circuit 2 (shown in the photo and schematic). Notice the intensity of the LED. Answer the questions:

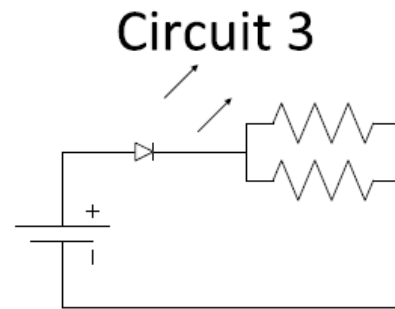
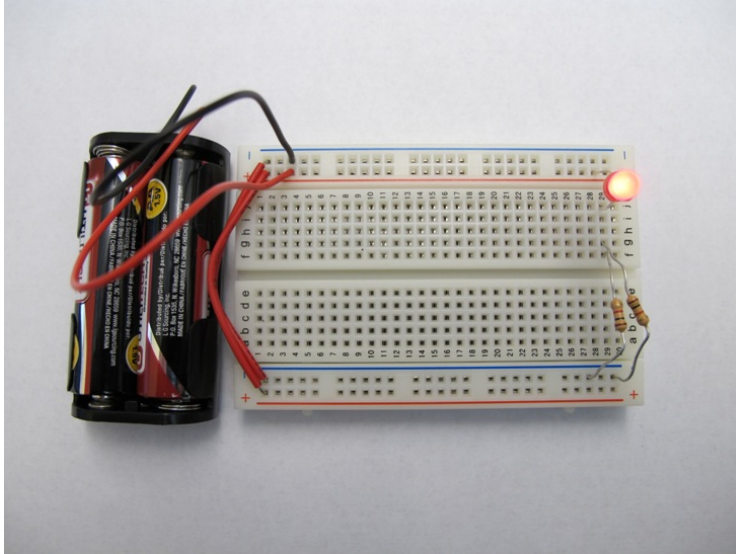
2. What is the theoretical current through the LED of this circuit?
3. Is the LED brighter or dimmer than in circuit 1? Why?



### Circuit 3

Build Circuit 3 (shown in the photo and schematic). Notice the intensity of the LED. Answer the questions:

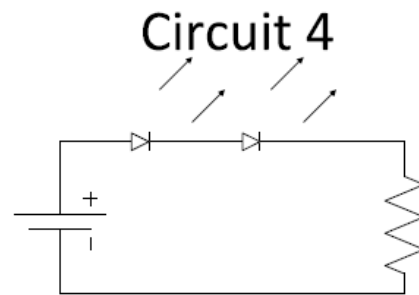
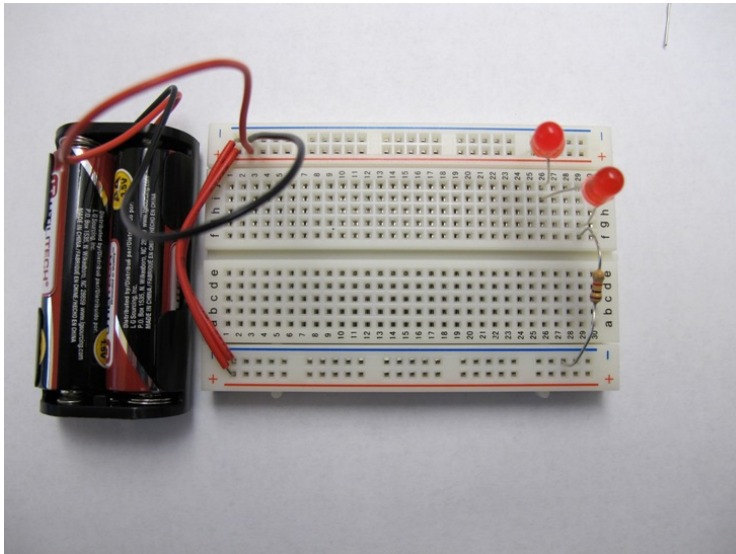
4. What is the theoretical current through the LED of this circuit?
5. Is the LED brighter or dimmer than in circuit 1? Why?



### Circuit 4

Build Circuit 4 (shown in the photo and schematic). Notice the intensity of the LEDs. Answer the questions:

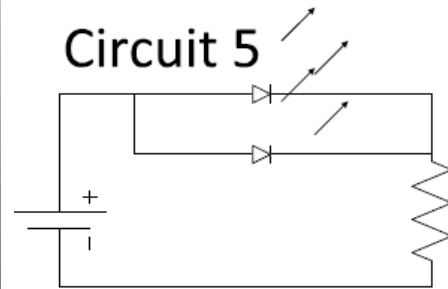
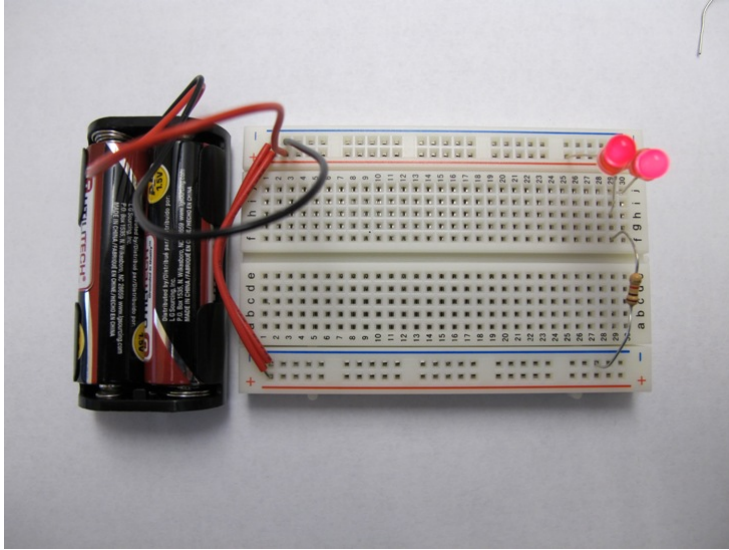
6. What is the theoretical current through each of the LEDs of this circuit?
7. Are the LEDs brighter or dimmer than in circuit 1? Why?



### Circuit 5

Build Circuit 5 (shown in the photo and schematic). Notice the intensity of the LED. Answer the questions:

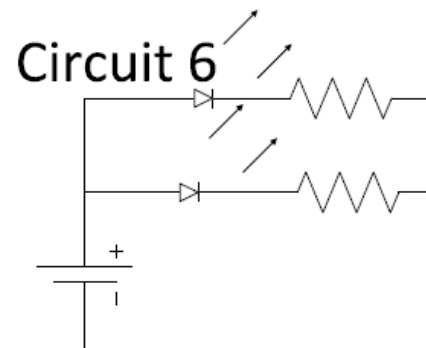
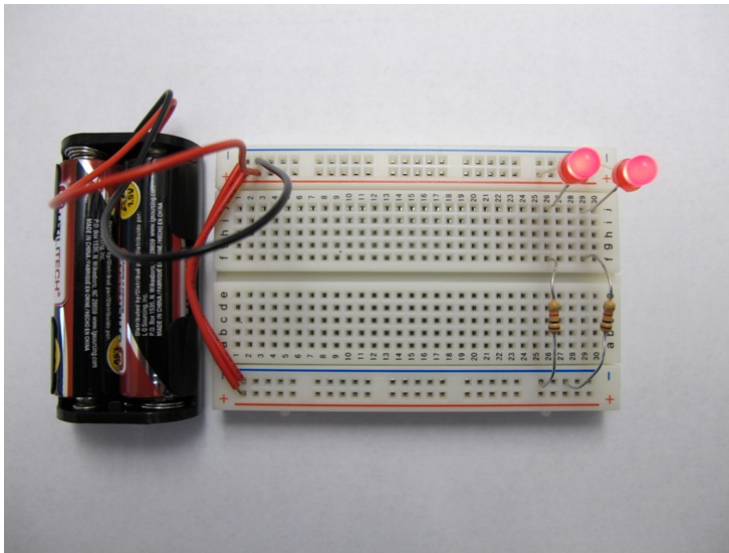
8. What is the theoretical current through each of the LEDs of this circuit?
9. Is the LED brighter or dimmer than in circuit 1? Why?



### Circuit 6

Build Circuit 6 (shown in the photo and schematic). Notice the intensity of the LED. Answer the questions:

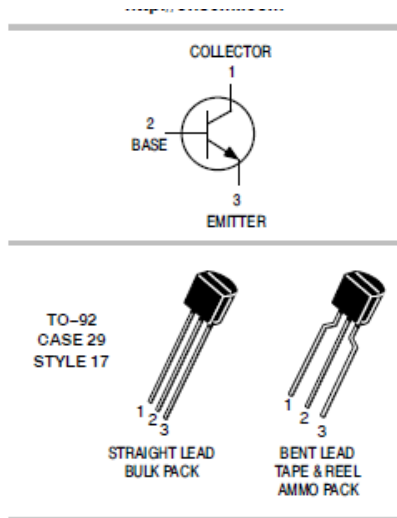
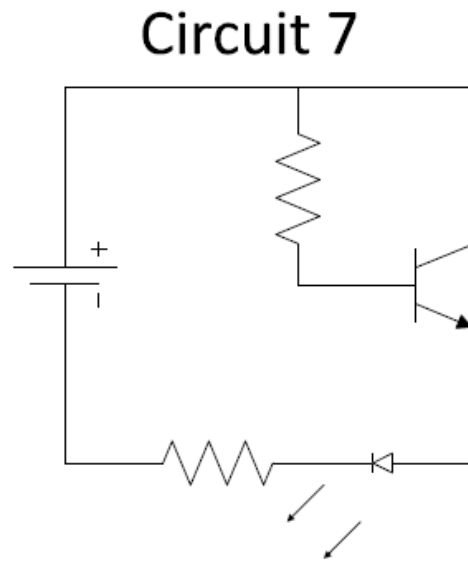
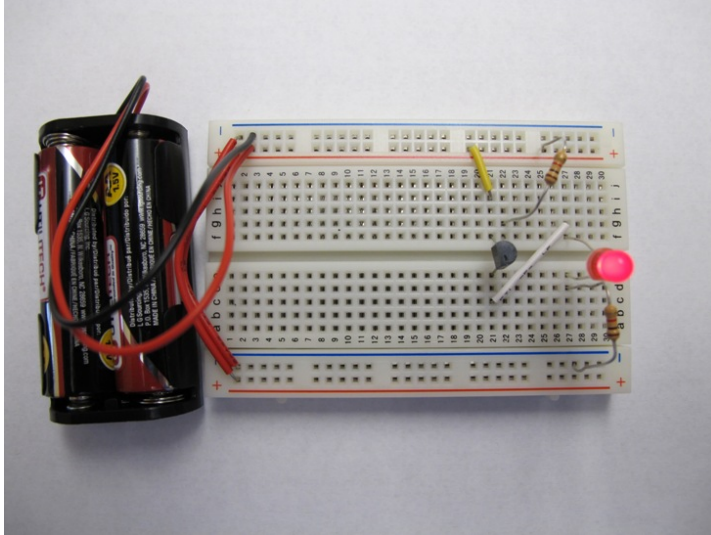
10. What is the theoretical current through each of the LEDs of this circuit?
11. Is the LED brighter or dimmer than in circuit 1? Why?



## Circuit 7

Build Circuit 7 (shown in the photo and schematic). Notice the intensity of the LED. Answer the questions:

12. What is the function of the transistor?
13. Is the LED brighter or dimmer than in circuit 1? Why?

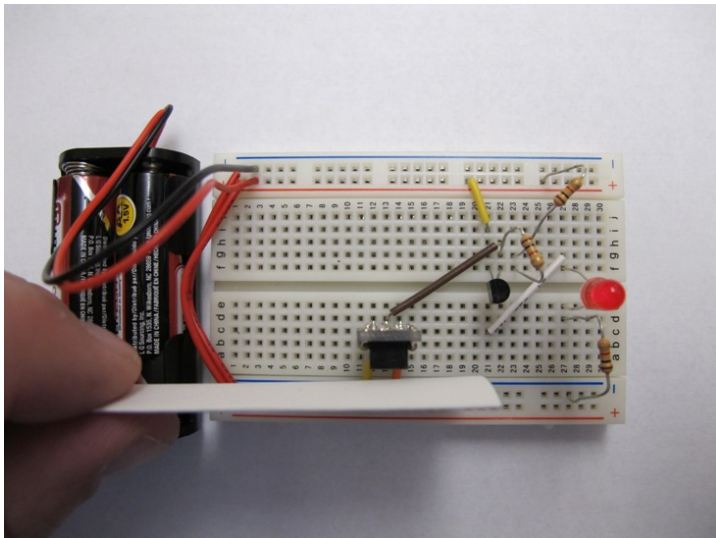
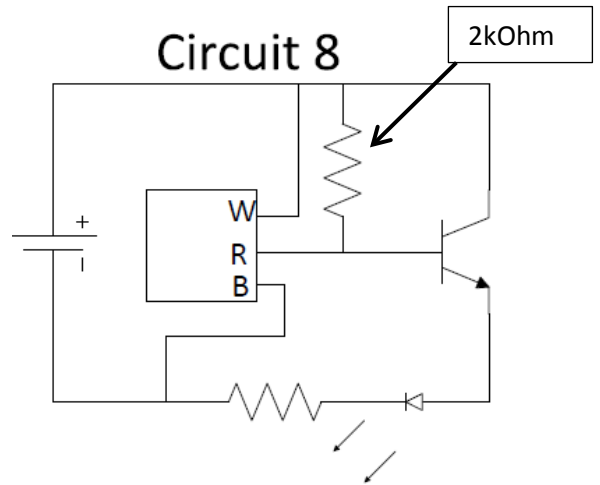
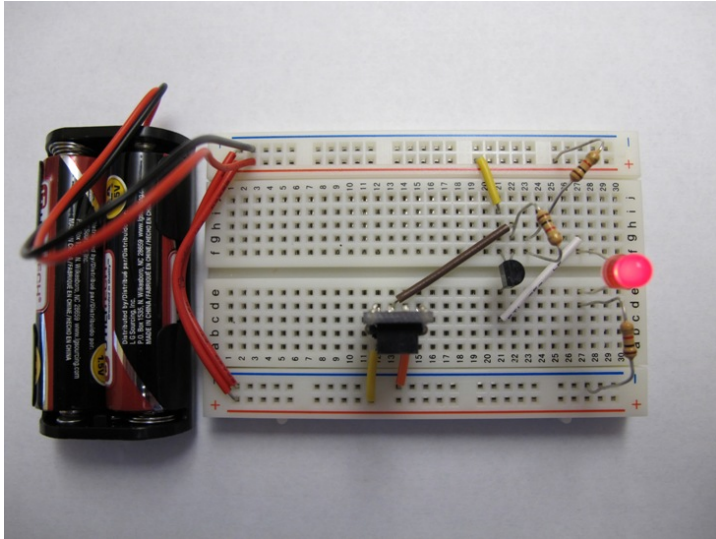




### Circuit 8

Build Circuit 8 (shown in the photo and schematic). Note that one of the resistors is 2kOhms. Notice the intensity of the LED when you hold a reflective card in front of the QTI sensor.

14. How did you make the 2kOhm resistor from the parts you had in hand?
15. What is the function of the QTI sensor?
16. What do you think is the function of the 2kOhm resistor?
17. Is the LED brighter or dimmer than in circuit 1? Why? How does it change?



### Additional Questions

18. What did you learn about electrical circuits in this lab?