

## PreLab 1 – LED Transmitter

### • GOAL

The overall goal of PreLab1 is to simulate your LED transmitter.

### • GENERAL GUIDELINES

- 1) Students are allowed (even encouraged) to work together. **However, you must turn in your own work!**
- 2) Prelabs count for 10% of the total lab grade.
- 3) Prelabs are due at the beginning of the lab session. The prelab will be graded using the following binary rubric: reasonable effort = 10 pts, poor effort = 0 pts.
- 4) The prelab assignment will be returned to you. You can then use the graphs to check your actual experimental measurements.

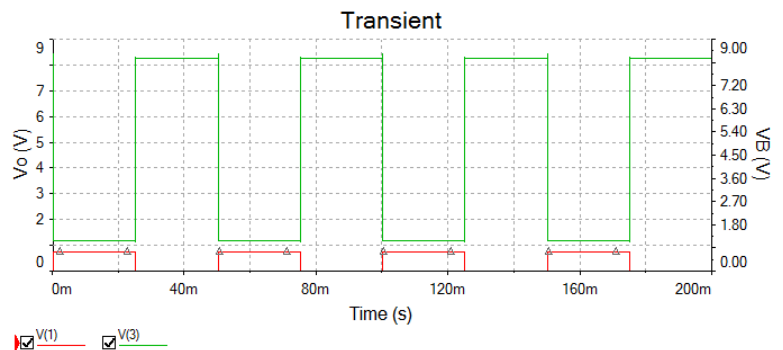
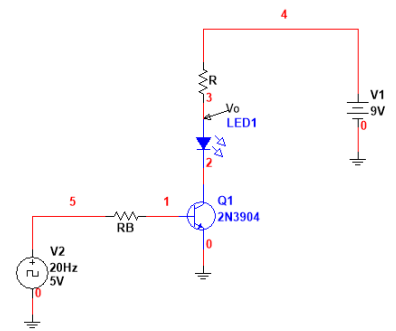
### • DESIGN CALCULATIONS

- Show the calculations you made for R and  $R_B$ .

### • SIMULATION

Simulate your transmitter circuit using the resistor values from your calculations.

- See the course website for a refresher tutorial on Multisim.
- The voltage source is a “Pulse” that goes from 0 to 5V. The frequency is 20 Hz and 50% duty cycle. You can use the default rise and fall times.
- Choose a red LED.
- Perform a transient simulation for 200 ms (max step size = 200  $\mu$ s).
- Show your circuit schematic and waveforms of  $V_{IN}$ ,  $V_B$ , and  $V_O$  (see figure).
- Prove that your simulated LED current satisfies the design requirement (10 mA).



NOTE: In the actual lab session, you will compare these simulated waveforms to your oscilloscope measurements.