## 8.5.1 Part 1: Second Order Series RLC Circuit (35 points total)

1. In the space below, provide the differential equation governing the circuit. Attach, to this worksheet, your derivation of the differential equation. (6 pts)
2. Attach, to this worksheet, plots of the input step function you applied to the circuit and the resulting circuit step response. Annotate your plot to indicate the rise time, overshoot, and oscillation frequency. Provide the rise time, overshoot, and oscillation frequency in the space below. (9 pts)
3. Provide below your estimate of the damping ratio, natural frequency, DC gain, and damped natural frequency, as determined from the step response data. (6 pts)
4. **DEMO**: Have a teaching assistant initial this sheet, indicating that they have observed your circuits’ operation. (7 pts)

**TA Initials: \_\_\_\_\_\_\_**

1. Discuss your results below. Be sure to include a comparison of appropriate parameters (e.g. damping ratio, natural frequency, damped natural frequency, rise time, steady state response) relative to the values expected as a result of your pre-lab analysis. (7 pts)

## 8.5.1 Part 2: Critically Damped Series RLC Circuit (25 points total)

1. Provide below a schematic of the critically damped circuit, including desired values for the resistor, capacitor and inductor. Attach to this worksheet the analysis used to determine these values. (7 pts)
2. Attach to this worksheet plots of the input step function you applied to the circuit and the resulting circuit step response. (5 pts)
3. **DEMO**: Have a teaching assistant initial this sheet, indicating that they have observed your circuits’ operation. (7 pts)

**TA Initials: \_\_\_\_\_\_\_**

1. Comment below on your circuit’s measured response vs. your expectations as to the response shape. Does the circuit have the expected overshoot and DC gain? (6 pts)