Lab 7: Prelab

Read through the entire lab assignment and complete the following before coming to lab. The prelab should be completed by individual students, not by a lab team.

**Part 1: LabVIEW User Interface**
Consider the input and output needs of an instrumentation amplifier, and think about how those needs could be met using a LabVIEW interface. If necessary, look back at Lab 6 and note the inputs and outputs required to test circuit features. Think of how you would construct the “instrument panel” for a LabVIEW vi. For your prelab assignment, sketch an initial concept for the user interface of this vi (what toggles, buttons, displays, etc. would be on your user interface). Be sure to consider both the AC and DC requirements. You will be asked to implement these functions during the in-lab assignment, so the better you prepare here the faster that will go. You are welcome, but not required, to start constructing your .vi in LabVIEW before coming to lab.

At the beginning of the lab, ask the TA to review your LabVIEW plan/sketch and sign off on the Prelab Grading Sheet. That way you can keep your plan/sketch for use during the lab. At the end of the lab, turn in your plan/sketch and the signed Prelab Grading Sheet.

**Part 2: Variable Gain Instrumentation Amplifier**
Within a SPICE simulation program, construct the variable gain instrumentation amplifier circuit defined by the schematic in part D of Lab 7. Use the OP467 subcircuit for the opamp.

1. Connect the negative input to analog ground and the positive input to a sine wave with 100mV amplitude and 1kHz frequency. Simulate the transient analysis for R₆ resistance values from 10kΩ to 100kΩ (the max value of your trimmer) in 10kΩ steps. Record the output voltage amplitude at each resistance on the table in the Prelab Grading Sheet and calculate the gain at each R₆ value (remember, the input is 100mV amplitude). Then, sketch a plot the differential gain vs. the resistance of R₆ using the grid on the Prelab Grading Sheet. Be sure to label the axes.

2. Next, connect both inputs to a sine wave with 1V amplitude and 1kHz frequency, simulate the transient analysis for several values of R₆, and complete the table in the Prelab Grading Sheet. Then sketch a plot the common mode gain vs. R₆. Label the axes.

Submit a print of your SPICE netlist along with the Prelab Grading Sheet.
Lab 7: Prelab Grading Sheet

Name: ________________________________

Part 1: LabVIEW User Interface

*TA check off: Part 1 LabVIEW plan (TA signature) ________________________________

Part 2: Variable Gain Instrumentation Amplifier

Differential Gain vs. \( R_6 \).

<table>
<thead>
<tr>
<th>( R_6 )</th>
<th>10k</th>
<th>20k</th>
<th>30k</th>
<th>40k</th>
<th>50k</th>
<th>60k</th>
<th>70k</th>
<th>80k</th>
<th>90k</th>
<th>100k</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{out} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>( Gain )</td>
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</tr>
</tbody>
</table>

Common Mode Gain vs. \( R_6 \).

<table>
<thead>
<tr>
<th>( R_6 )</th>
<th>20k</th>
<th>40k</th>
<th>60k</th>
<th>80k</th>
<th>100k</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{out} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( Gain )</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Lab 7 Grading Sheet

PARTNER NAMES: __________________________________________________________

B.1a
trimmer value = ___________ Ω

B.2
max voltage = ___________ V    min voltage = ___________ V
differential gain= ___________

B.3
TA check off (TA signature) ______________________________

C.2
Print DC transfer function (Step 1 to 3 of part D in Lab 6)
Differential gain= __________
Common mode gain= __________

C.3
trimmer value = ___________ Ω

C.4
TA check off of LabVIEW operation (TA signature) ______________________________

D.5
TA check off (TA signature) ______________________________

E.7
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
E.8

<table>
<thead>
<tr>
<th>Frequency</th>
<th>1KHz</th>
<th>10KHz</th>
<th>100KHz</th>
<th>1MHz</th>
<th>10MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E.9

3dB bandwidth = ____________

E.10

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

E.11

TA check off (TA signature) ______________________________