The University of Jordan
School of Engineering
Electrical Engineering Department

EE 449
Instrumentation and Control Lab

EXPERIMENT 9 REPORT
INSTRUMENTATION AMPLIFIER

Section # _____ Group # _____

	Student Name	ID
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EXPERIMENT 9
INSTRUMENTATION AMPLIFIER

PROCEDURE A: INSTRUMENTATION AMPLIFIER

3. Using a voltmeter, measure both V_{CC} and V_{EE} compared to GND. Write both values below:

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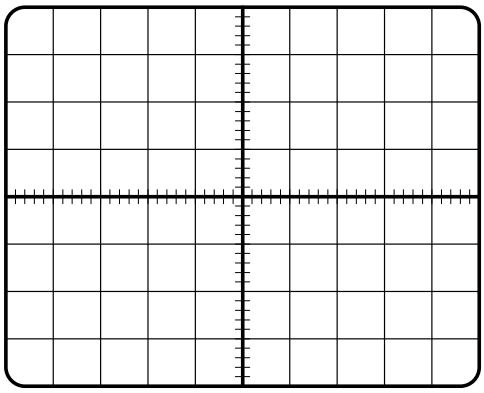
7. Observe and draw below both the input signal (CH1) and output signal (CH2) from the instrumentation amplifier. The output signal might look noisy due to its very small value.



8. Using the oscilloscope, measure the peak-to-peak value of both the input signal (CH1) and output signal (CH2), and write these values below. You might need to use the divisions on the oscilloscope screen to read the peak-to-peak values, rather than relying on the MEASURE feature of the oscilloscope due to the small and noisy output signal. Alternatively, you might try going into the **ACQUIRE** menu of the oscilloscope, and change the **Acquire Mode** from **Normal** to **Average**, and set the **Average Count** to 128, which attempts to smooth the output signal shown on the oscilloscope. Remember to go back to Normal Acquire Mode for later steps in the procedure.

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14. Now that you have measured the output due to a common-mode input (step 8) and also the output due to a differential-mode input (step 12), write those values in the table below.

R_G	Frequency	V_{cm} pk-to-pk	V_{out} pk-to-pk	V_{diff} pk-to-pk	V_{out} pk-to-pk
4.7 kΩ	1 kHz	10 Vpp	_____ Vpp	0.5 Vpp	_____ Vpp
4.7 kΩ	20 kHz	**5 Vpp**	_____ Vpp	0.5 Vpp	_____ Vpp
4.7 kΩ	100 kHz	5 Vpp	_____ Vpp	0.5 Vpp	_____ Vpp
2.2 kΩ	1 kHz	10 Vpp	_____ Vpp	**0.3 Vpp**	_____ Vpp
2.2 kΩ	20 kHz	**5 Vpp**	_____ Vpp	0.3 Vpp	_____ Vpp
2.2 kΩ	100 kHz	5 Vpp	_____ Vpp	0.3 Vpp	_____ Vpp

16. Use the above measured values to calculate the common mode gain, differential-mode gain, and CMRR for the different cases shown above. Write your answers in the table below.

R_G	Frequency	G_{cm} (unitless)	G_{diff} (unitless)	CMRR (unitless)	CMRR (dB)
4.7 kΩ	1 kHz				
4.7 kΩ	20 kHz				
4.7 kΩ	100 kHz				
2.2 kΩ	1 kHz				
2.2 kΩ	20 kHz				
2.2 kΩ	100 kHz				

17. Explain your findings with regard to the difference between the common-mode gain and the differential-mode gain.

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18. Explain the effect of input signal frequency and instrumentation amplifier gain on CMRR.

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PROCEDURE B: DIFFERENTIAL AMPLIFIER

2. Repeat the procedure you executed for the instrumentation amplifier but this time to measure the output of this differential amplifier in response to a common-mode input signal of: (10 Vpp, 1 kHz), (5 Vpp, 20 kHz) and (5 Vpp, 100 kHz). Use the above circuit. Write you measured values in the table below.

Gain	Frequency	V_{cm} pk-to-pk	V_{out} pk-to-pk	V_{diff} pk-to-pk	V_{out} pk-to-pk
10	1 kHz	10 Vpp	_____ Vpp	0.5 Vpp	_____ Vpp
10	20 kHz	5 Vpp	_____ Vpp	0.5 Vpp	_____ Vpp
10	100 kHz	5 Vpp	_____ Vpp	0.5 Vpp	_____ Vpp

4. Use the above measured values to calculate the common mode gain, differential-mode gain, and CMRR for the different cases shown above. Write your answers in the table below.

Gain	Frequency	G_{cm} (unitless)	G_{diff} (unitless)	CMRR (unitless)	CMRR (dB)
10	1 kHz				
10	20 kHz				
10	100 kHz				

5. Explain your findings with regards to the difference between the CMRR for an instrumentation amplifier versus a regular differential amplifier. Explain why this is the case.

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