Wheatstone bridge & amplifiers: Deliverables

ME 240: Fundamentals of Instrumentation & Measurement • D. H. Kelley and I. Mohammad • 143 points

Name: _____ Student ID: _____

Lab partners: _____

Please write the following sentence in the box below in your own handwriting and **SIGN**: ***"I affirm that I have not given or received any unauthorized help on this assignment, and that this work will be my own."***

Voltage divider measurement and analysis

1. (2 points) Attach a photo of two resistors.
2. (2 points) According to their colored stripes, what are the values of your two resistors?

   _____ _____

3. (2 points) What are the measured values of your two resistors?

   _____ _____

4. (3 points) What are the percent differences between the expected and measured values of your two resistors?

5. (3 points) Using $V_{\text{in}} = 7$ V, calculate the expected values of V_1 and V_2.

6. (2 points) What are the measured voltages, with $V_{\text{in}} = 7$ V?

   $V_1 =$ _____ $V_2 =$ _____

7. (3 points) What are the percent differences between the expected and measured values of V_1 and V_2?

8. (2 points) What are the measured voltages, with $V_{\text{in}} = 3.5$ V?

   $V_1 =$ _____ $V_2 =$ _____

9. (2 points) Comment briefly on the changes to V_1 and V_2 caused by altering V_{in}.

Current divider measurement and analysis

10. (3 points) Using $I_{\text{in}} = 50$ mA, calculate the expected values of I_3 and I_4.

11. (2 points) What are the measured currents, with $I_{\text{in}} = 50$ mA?

    $I_3 =$ _____ $I_4 =$ _____

12. (3 points) What are the percent differences between the expected and measured values of I_3 and I_4?

13. (2 points) What are the measured currents, with $I_{\text{in}} = 25$ mA?

    $I_3 =$ _____ $I_4 =$ _____

14. (2 points) Comment briefly on the changes to I_3 and I_4 caused by altering I_{in}.

Wheatstone bridge measurement and analysis

15. (2 points) With $R_5 \approx 123\ \Omega$, value of δR, from resistance measurements: _____

16. (2 points) With $R_5 \approx 123\ \Omega$, measured value of V_{out}: _____

17. (2 points) With $R_5 \approx 123\ \Omega$, value of δR, calculated from V_{out}: _____

18. (2 points) What is the percent difference between the expected and measured values of δR, with $R_5 \approx 123\ \Omega$?

19. (2 points) With $R_5 \approx 117\ \Omega$, value of δR, from resistance measurements: _____

20. (2 points) With $R_5 \approx 117\ \Omega$, measured value of V_{out}: _____

21. (2 points) With $R_5 \approx 117\ \Omega$, value of δR, calculated from V_{out}: _____

22. (2 points) What is the percent difference between the expected and measured values of δR, with $R_5 \approx 117\ \Omega$?

Differential amplifier measurement and analysis

23. (2 points) If the input voltage $(V_2 - V_1)$ has peak-to-peak amplitude 500 mV, calculate the peak-to-peak amplitude of the output voltage V_{out}.

24. (2 points) Calculate the differential gain $V_{\text{out}}/(V_2 - V_1)$.

25. (2 points) With 500 mV input, measured peak-to-peak amplitude of the out voltage V_{out}:

_____

26. (2 points) With 500 mV input, what is the percent difference between the expected and measured values of V_{out}?

27. (2 points) With 250 mV input, measured peak-to-peak amplitude of the out voltage V_{out}:

_____

28. (2 points) With 250 mV input, what is the percent difference between the expected and measured values of V_{out}?

29. (2 points) Comment briefly on the changes to V_{out} caused by altering $(V_2 - V_1)$.

30. (20 points) Type and attach an abstract.

31. (20 points) Type and attach an introduction for this exercise. An introduction gives your readers the background and context of the work you are presenting. The structure of the introduction can be thought of as an upside-down triangle, from general to specific. Start by broadly introducing the topic. Then, provide general background information, narrowing into the specific focus of the exercise. End by stating a thesis statement.

32. (20 points) Type and attach a description of the methods used.

33. (20 points) Type and attach a description of your results.