

P1320L, Mutual Inductance

Lab 12, Work Sheet

Submitted by: _____ Experiment's date: _____

Team members:

1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor must initial: _____

Introduction

Write a short paragraph about the purpose of this lab.

Data

Instructions: Collect your data using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Each measurement must have units. If a table is used, then it must have headers (for rows or columns) that include units

1. Measure and record the diameter of the secondary coil. Also, record the number of turns it has.

2. Record the length and number of turns of the primary coil.

3. For your resistor, measure and record its actual resistance.

4. Using the Oscilloscope, set the signal generator to a 1 kHz sinusoidal wave. Measure the period of the wave and write it down.

5. After setting the circuit of Figure 12.3 of the lab manual, vary the input voltage from 2 to 12 V (peak-to-peak) in increments of 2 V. Make a table to record each the input voltage, the voltage drop across the resistor, and the corresponding voltage across the terminals of the secondary coil.

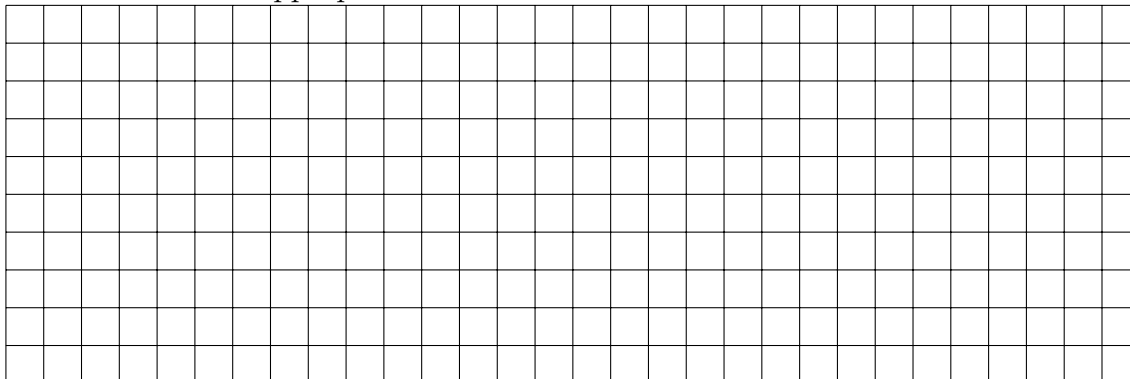
6. After introducing the metal core into the secondary coil, repeat the previous step.

Analysis

Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for

each result requested. The results must include appropriate SI units. If a table is used, then it must have headers (for rows or columns) that include units

1. For each voltage across the resistor, use Ohm's law to calculate the peak-to-peak value of the current flowing through the resistor and then apply Kirchhoff's node law to determine the peak-to-peak value of the current flowing through the primary coil. Include these values in the Data tables above.
2. For the data corresponding to the Air core on the secondary coil, use the grid below to make a scatter plot of the peak-to-peak values of the voltage on the secondary coil and the peak-to-peak values of the current flowing through the primary coil (use the x-axis for the current). Draw the best-fit line for your data. The plot axes must include labels with appropriate SI units.



3. Using the same grid as above, repeat the previous step for the data corresponding to the metal core. Plot these data on the same axis as the data for the air core.
4. Determine the slope for each of the best-fit lines.

5. From the period of the input signal, determine the angular frequency.

6. Use the slope from the best-fit line and equation (12.8) from the lab manual to obtain the experimental values of the coils' Mutual inductance for both, the Air and metal core cases.

7. Use equation (12.10) and the experimental value of the mutual inductance to determine the value of μ for air and the metal core.

8. Compare the value of μ for air with the value of μ_0 .