LAB # 03
Inductive Reactance

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Section: **“A”**

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COMPUTER SYSTEM ENGINEERING

ASSESSMENT RUBRICS

LAB REPORT ASSESSMENT				
Criteria	**Excellent**	**Average**	**Nil**	**Marks Obtained**
1. Objectives of Lab	All objectives of lab are properly covered [Marks 1]	Objectives of lab are partially covered [Marks 0.5]	Objectives of lab are not shown [Marks 0]	
2. Procedure	All experimental steps are shown. [Marks 2]	Some of the steps are shown. [Marks 1]	Experimental steps not shown [Marks 0]	
3. Demonstration of Concepts	The student demonstrated a clear understanding of the assignment concepts [Marks 2]	The student demonstrated a clear understanding of some of the assignment concepts [Marks 1]	The student failed to demonstrate a clear understanding of the assignment concepts [Marks 0]	
4. Experimental Results	All experimental results are completely shown in form of table [Marks 3]	Experimental results are partially shown and some of the observations are missing [Marks 1.5]	No experimental results are shown [Marks 0]	
5. conclusion	Conclusion of the lab is properly written [Marks 2]	Conclusion of the lab is partially written [Marks 1]	Conclusion of lab is not written [Marks 0]	

Total Marks Obtained: ___________

Instructor Signature: ________________________

Lab 3

Inductive Reactance

Objective:

Inductive reactance will be examined in this exercise. In particular, its relationship to inductance and frequency will be investigated, including a plot of inductive reactance versus frequency.

Inductive Reactance:

Inductive reactance is the property of an inductive coil that resists the change in alternating current (AC) through it and is similar to the opposition to direct current (DC) in a resistance.

Procedure

- Current Source

Using Figure 1 with Vin=10 V_{p-p} and R=10 kΩ, and assuming that the reactance of the inductor is much smaller than 10k and can be ignored, determine the circulating current using measured component values and record in Table 1.

- Measuring Reactance

Build the circuit of Figure 1 using R=10 kΩ, and L=10 mH. Place one probe across the generator and another across the inductor. Set the generator to a 1000 Hz sine wave and 10Vp-p. Make sure that the Bandwidth Limit of the oscilloscope is engaged for both channels. This will reduce the signal noise and make for more accurate readings.

- Calculate the theoretical value of XL using the measured inductor value and record in Table2.
- Record the peak-to-peak inductor voltage and record in Table 2.
- Using the source current from Table 1 and the measured inductor voltage, determine the experimental reactance and record it in Table 2. Also compute and record the deviation.
- Repeat steps three through five for the remaining frequencies of Table 2.
- Replace the 10 mH inductor with the 1mH unit and repeat steps two through six, recording results in Table 3.
  Using the data of Tables 2 and 3, create plots of inductive reactance versus frequency.

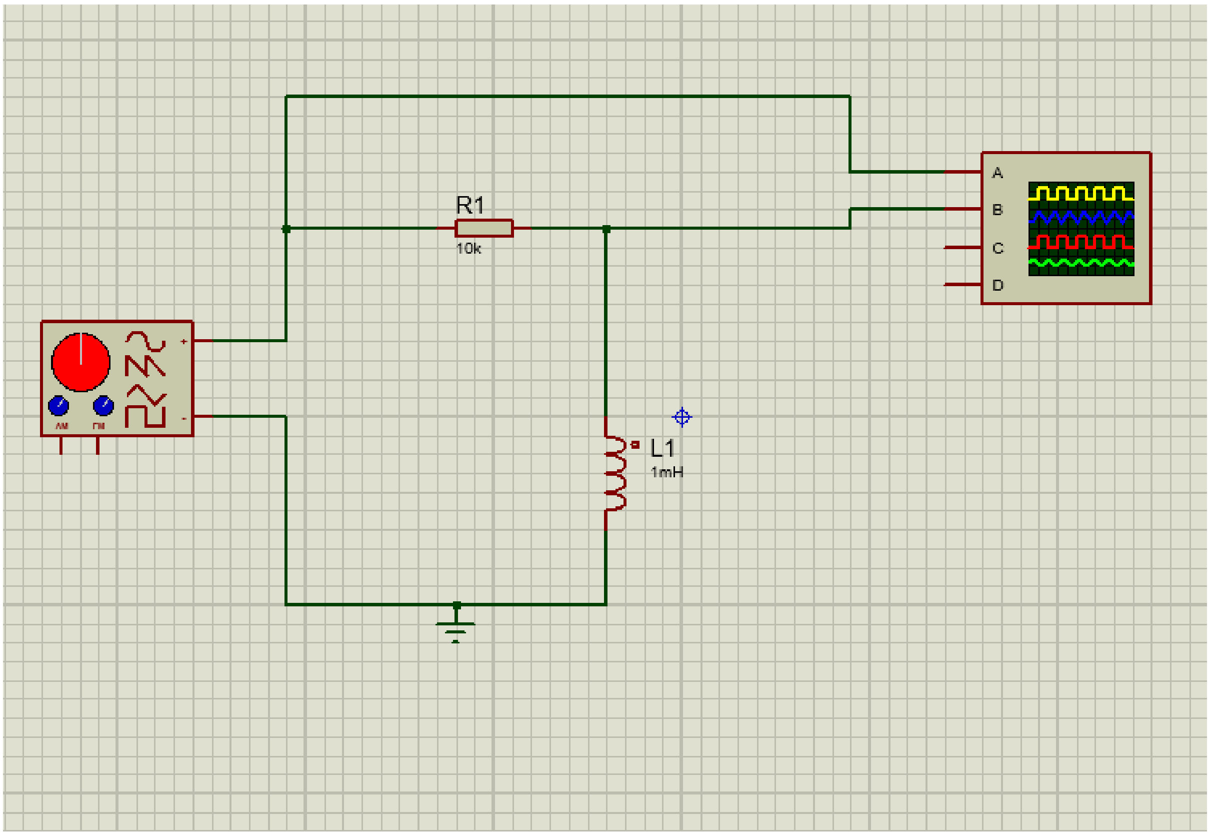
Equipment

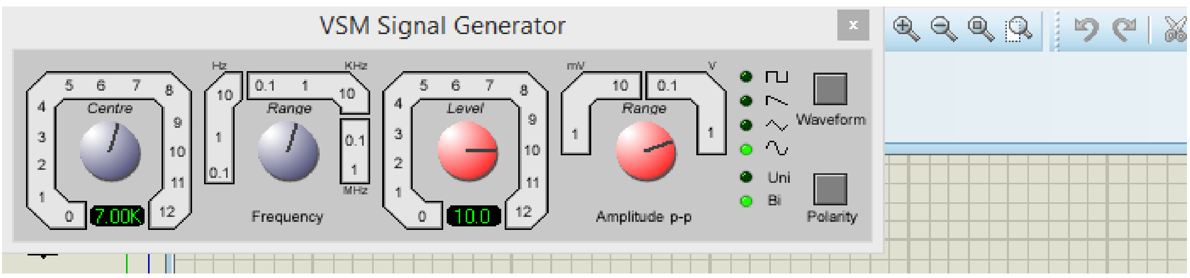
1. AC Function Generator
2. Oscilloscope DMM

Components

- 1 mH   actual: ____________________
- 10 mH actual: ____________________
- 10 kΩ   actual: ____________________

Circuit Diagram:





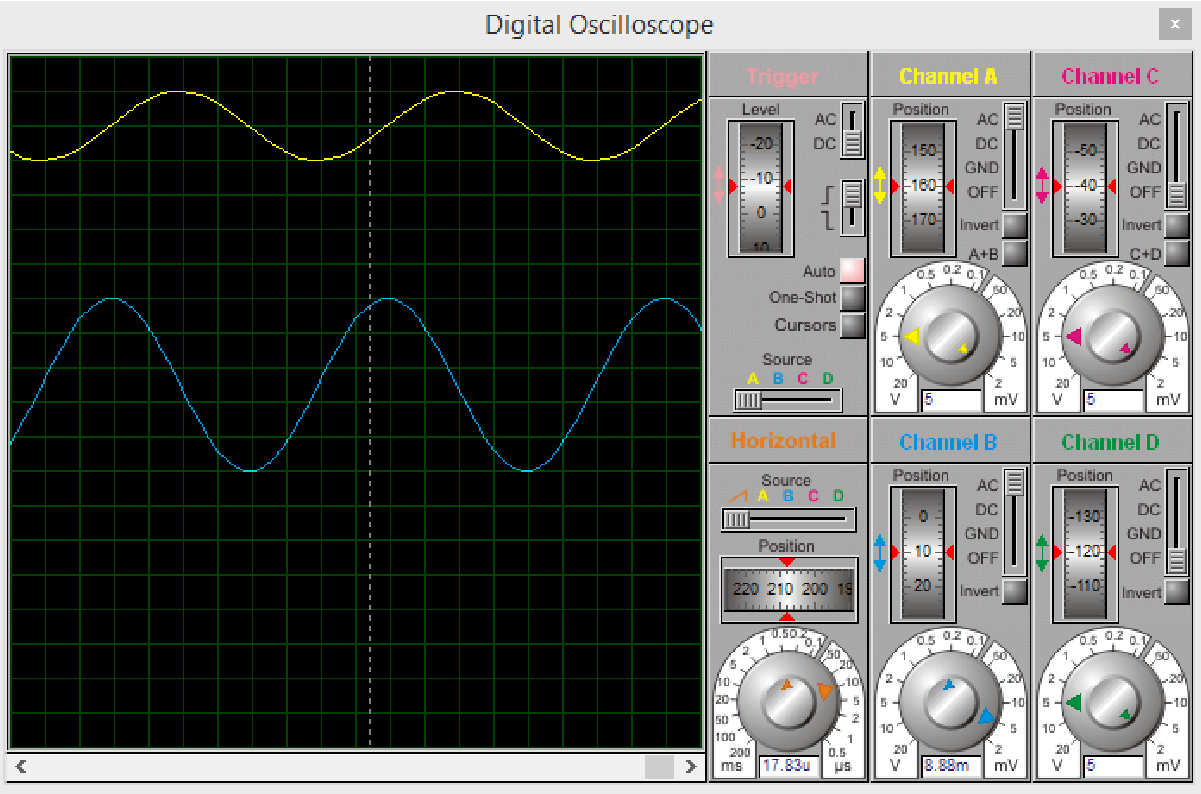


Table-1:

Frequency	X_L Theory	$V_{L(p-p)}$ Exp	X_L Exp	%Dev
1k	6.28	6.64	6.64	5.7
2k	12.56	12.92	12.92	2.78
3k	18.84	19.38	19.38	2.87
4k	25.12	25.6	25.6	1.95
5k	31.4	32	32	1.84
6k	37.68	38.16	38.16	1.27
7k	43.96	44.8	44.8	1.91
8k	50.24	53.55	53.55	5.58
10k	62.8	62.64	62.64	0.25

Table-2:

Frequency	X_L Theory	$V_{L(p-p)}$ Exp	X_L Exp	%Dev
10k	62.8	62.64	62.64	0.25
20k	125.6	0.13	130	3.38
30k	188.4	0.196	196	3.8
40k	251.2	0.26	260	3.38
50k	314	0.32	320	1.875
60k	376.8	0.39	390	3.38
80k	502.4	0.51	510	1.49
100k	628	0.65	650	3.38

Questions:

1. What is the relationship between inductive reactance and frequency?

Ans:

Inductive reactance is the property of an inductive coil that resists the change in alternating current (AC) through it and is similar to the opposition to direct current (DC) in a resistance.

The Inductive reactance is directly proportional to frequency**.**

$$X_L=2\pi fL$$

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2. What is the relationship between inductive reactance and inductance?

Ans:

Inductance is the tendency of an electrical conductor to oppose a change in the electric current flowing through it. The flow of electric current creates a magnetic field around the conductor.

$$\mathbf{L=N\theta/I}$$

Where ϕ is flux, N is number of turns, and I is current.

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3. Do the coil resistances have any effect on the plots?

Ans:

After creating the geometry (the coil), assigning a material (copper) and assigning electric potentials, the current through the coil can be calculated. I suppose this is calculated from the potentials and from the resistance. I also suppose that the resistance is determined from the conductivity, length and cross-sectional surface. I want to know the value of the total resistance.
