Title: **RL Parallel Circuit** Lab: 26

Course: Electrical Applications Unit: Electrical Lab CLO: 2, 3, 4

Name ANSWER KEY Grade 62pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall identify the relationship between voltage and current in a resistive-inductive (RL) circuit.
2. Student shall construct an AC RL parallel circuit, take voltage readings and analyze the results.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Lab. Grading shall be based on instructor evaluation.

**Materials**

|  |  |
| --- | --- |
| Student Provided Materials | Department Provided |
| Proto-Board | Oscilloscope |
| Multimeter | Waveform Generator |
| Resistor Kit |  |
| Component Kit |  |
| Calculator |  |

**Theory**

An inductor is an electrical component, most often made from a coil of wire, that resists changes in current. We use a three-letter acronym to denote this relationship.

E L I

Where;

E = Voltage

L = Inductance and the verb “Leads”

I = Current

The acronym *ELI* is read, “Voltage Leads Current…”. The *L* in the middle has a double meaning indicating “… for an Inductive circuit”.

**Graphic**

|  |  |
| --- | --- |
|  |  |
|  |

|  |  |  |
| --- | --- | --- |
| Impedance Triangle | | Power Triangle |
|  | |  |
|  |  |  |
| Current Response | | Voltage Response |
|  | |  |
|  | |  |

**Circuit**



Where;

**Instructions**

Calculations

Calculate the expected quantities base on the information given above. The θ is the angle from the current triangle. NOTE: PF cannot be calculated

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Frequency | XL | IL | IR | θI | IT | PF |
|  | 1kHz | 207.345Ω | 6.029mA | 5.682mA | 46.696˚ | 8.284mA | 0.686 |
|  | 2kHz | 414.69Ω | 3.014mA | 5.682mA | 27.947˚ | 6.432mA | 0.883 |
|  | 3kHz | 622.035Ω | 2.010mA | 5.682mA | 19.478˚ | 6.027mA | 0.943 |

Fill in the total current, resistive current, reactive current and phase angle on each triangle below.

|  |  |  |
| --- | --- | --- |
| 1kHz | 2kHz | 3kHz |
|  |  |  |

Application

Build the circuit shown above. Measure and/or calculate and record each of the quantities below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Frequency | XL | IL | IR | θ | IT | PF |
|  | 1kHz |  |  |  |  |  |  |
|  | 2kHz |  |  |  |  |  |  |
|  | 3kHz |  |  |  |  |  |  |

Fill in the total current, resistive current, reactive current and phase angle on each triangle below.

|  |  |  |
| --- | --- | --- |
| 1kHz | 2kHz | 3kHz |
|  |  |  |

Evaluations

1. Is there a phase shift between voltage and current in a resistor?
   1. Yes
   2. No
2. As frequency increases the inductive current?
   1. Increases
   2. Decreases
   3. Stays the same
3. As the frequency increases the phase angle?
   1. Increases
   2. Decreases
   3. Stays the same
4. As the phase angle increases the total circuit current
   1. Increases
   2. Decreases
   3. Stays the same
5. As the power factor increases, the total current will increase.
   1. True
   2. False
6. As the frequency decreases, IR will;
   1. Increase
   2. Decrease
   3. Stay the same
7. Impedance for an RL parallel circuit is calculated the same as that of a RL series circuit.
   1. True
   2. False
8. The reactive power consumed in this circuit will be across the;
   1. Resistor
   2. Inductor

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