Title: **RL Series Circuit** Worksheet: 30

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 80pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall determine the missing component(s) in a RL series circuit given other known quantities.
2. Student shall apply trigonometric functions to produce appropriate RL series circuit quantities.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Worksheet. Grading shall be based on an answer key.

**Theory**

A resistive-inductive (RL) series circuit is one that shares the same current through both the resistive and inductive components within the circuit. Since there is the existence of the impedance triangle, there shall also be a voltage and a power triangle.

|  |  |  |
| --- | --- | --- |
| Impedance Triangle Opposition to current flow | | Power Triangle Presence of Reactive Power |
|  | |  |
|  |  |  |
| Current Response Same current thru each component | | Voltage Response Total voltage is the vector sum |
|  | |  |
|  | |  |

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**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 391.096mW | | 18.053mA | | 1.2kΩ | 21.664V |
| L1 | 225.255mVAR | | 18.053mA | | 691.15Ω | 12.477V |
| Total | 451.326mVA | | 18.053mA | | 1.384kΩ | 25V |
| θ | 29.94˚ | PF | 0.867 |

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| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 298.234mW | | 15.765mA | | 1.2kΩ | 18.918V |
| L1 | 257.656mVAR | | 15.765mA | | 1.036kΩ | 16.344V |
| Total | 394.167mVA | | 15.765mA | | 1.586kΩ | 25V |
| θ | 40.825˚ | PF | 0.757 |

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| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 219.465mW | | 9.563mA | | 2.4kΩ | 22.95V |
| L1 | 94.802mVAR | | 9.563mA | | 1.036kΩ | 9.914V |
| Total | 239.066mVA | | 9.563mA | | 2.614kΩ | 25V |
| θ | 23.363˚ | PF | 0.918 |

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| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 149.117mW | | 7.882mA | | 2.4kΩ | 18.918V |
| L1 | 128.828mVAR | | 7.882mA | | 2.073kΩ | 16.344V |
| Total | 197.060mVA | | 7.882mA | | 3.172kΩ | 25V |
| θ | 40.825˚ | PF | 0.757 |

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 |  | |  | |  |  |
| L1 |  | |  | |  |  |
| Total |  | |  | |  |  |
| θ |  | PF |  |

Evaluations

Answer the following questions based on the last configured circuit above.

1. If the frequency is increased, the phase angle?
   1. Increases
   2. Decreases
   3. Stays the same
2. If the voltage is decreased, the power factor will?
   1. Increase
   2. Decrease
   3. Stay the same
3. If the inductance is increased, the total current will?
   1. Increase
   2. Decrease
   3. Stay the same
4. If the resistance is increased, the total current will?
   1. Increase
   2. Decrease
   3. Stay the same
5. If the inductance is decreased, the impedance will?
   1. Increase
   2. Decrease
   3. Stay the same
6. If the frequency is decreased, the active power will?
   1. Increase
   2. Decrease
   3. Stay the same
7. If the voltage is decreased, the reactive power will?
   1. Increase
   2. Decrease
   3. Stay the same