Title: **Impedance Triangle** Worksheet: 28

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 28pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall determine the impedance in a circuit given its inductance and the frequency.

**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**

Impedance is the opposition to current when AC voltage is applied to a circuit that contains some form of reactance (either inductive or capacitive). Impedance is a function of the resistance and reactive components in the circuit. Impedance extends the concept of resistance to AC circuits, and possesses both magnitude and phase, unlike resistance, which has only magnitude. The notion of impedance is useful for performing AC analysis of electrical networks, because it allows relating sinusoidal voltages and currents by a simple linear law. Impedance is represented in formulas by the letter Z. The unit of measure for impedance is the ohm (Ω).

The reciprocal of impedance is admittance, whose unit of measure is the Siemen (S). Admittance is represented by the letter *Y* in formulas.

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| --- | --- |
| Unit Circle | Impedance Triangle |
|  |  |
|  |  |
| Inductive Reactance Formula |  |
|  |  |
|  |  |

**Instructions**

Using the formulas from the previous page, determine the length of the unknown value given two other measurements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | R | XL | Z | θ |
| 1. | 330Ω | 110Ω | 347.851Ω | 18.435˚ |
| 2. | 567Ω | 289Ω | 636.404Ω | 27.008˚ |
| 3. | 780Ω | 234Ω | 814.344Ω | 16.699˚ |
| 4. | 220Ω | 45Ω | 224.555Ω | 11.56˚ |
| 5. | 2k | 916.515Ω | 2.2kΩ | 24.62˚ |
| 6. | 11.102kΩ | 4555Ω | 12kΩ | 22.308˚ |
| 7. | 559.999kΩ | 1.103kΩ | 560kΩ | 0.113˚ |
| 8. | 23Ω | 17.664Ω | 29Ω | 37.524˚ |
| 9. | 6.69kΩ | 4.2k | 7.899kΩ | 32.12˚ |
| 10. | 820.491Ω | 364.963Ω | 898Ω | 23.98˚ |
| 11. | 220Ω | 192.799Ω | 292.526Ω | 41.23˚ |
| 12. | 580Ω | 195.305Ω | 612Ω | 18.61˚ |

Evaluations

1. If the frequency increases, the impedance of a circuit will?
   1. Go Up
   2. Go Down
   3. Stay the same
2. If the resistance is increased in a resistive-inductive (RL) series circuit, the impedance will?
   1. Increase
   2. Decrease
   3. Stay the same
3. If phase angle of an impedance triangle decreases, which of the follow statements is true?
   1. The impedance will increase
   2. The inductive reactance has decreased
   3. The resistance has decreased
   4. The source voltage has increased
4. In an RL (resistive-inductive) series circuit, the relationship between voltage and current will be?
   1. Greater than 45˚ but less than 120˚
   2. Less than 90˚ but greater than 0˚
   3. Voltage and current in phase
   4. Voltage before current by 90˚