Title: **Transformers** Worksheet: 25

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 36pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall determine the types of measurement associated with transformers.
2. Student shall calculate various quantities of a transformer base on the given information.

**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 transformer is a static electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. An alternating current in one coil of the transformer produces an alternating magnetic field, which in turn induces an alternating current in a second coil. Power can be transferred between the two coils without an electrical connection between the two circuits. The connection is electromagnetic. Transformers are used to increase, decrease or isolate the *alternating current (AC)* in electric power applications. Since a transformer has all static parts, the work is done through the changing magnetic field of an AC signal. For this very reason, transformers work on AC only. Since DC has no expanding and collapsing magnetic field, no work can be done. Transformers do not work on DC sources.

|  |  |
| --- | --- |
|  | Where;  EP – Primary voltage of the transformer.  IP – Primary current of the transformer.  NP – Primary turns ratio.  ES – Secondary voltage of the transformer  IS – Secondary current of the transformer  NS – Secondary turns ratio |

Transformers come in three types; step-down (buck), step-up (boost), isolation.

1. A step-down transformer decreases the primary voltage to a lower secondary voltage.
2. A step-up transformer increases the primary voltage to a higher secondary voltage
3. An isolation transformer maintains the same voltage, but isolates one voltage source from another.

All transformers are rated by the volt-amperes (VA) that the *secondary* can output. This *apparent power* rating is represented by the letter “*S”* in formulas. No transformer is 100% efficient. In this worksheet, we will assume 100% efficiency even though that is not possible in a true application. In the next worksheet we will focus on efficiency. Below are the formulas for a transformer.

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

**Transformer**



**Instructions**

Complete the tables below based on the information given above and the formulas on page 1.

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 1VA | 4.167mA |  | 240V | 12 |
| S | 1VA | 50mA | 400Ω | 20V | 1 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 56.25VA | 37.5mA |  | 1500V | 20 |
| S | 56.25VA | 750mA | 100Ω | 75V | 1 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 62.5mVA | 12.5mA |  | 5V | 2 |
| S | 62.5mVA | 5mA | 2.5kΩ | 12.5V | 5 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 2.88VA | 120mA |  | 24V | 1 |
| S | 2.88VA | 120mA | 200Ω | 24V | 1 |