Title: **Transformer Efficiency** Worksheet: 26

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 and the efficiency of the transformer.

**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**

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. This inefficiency is due to transformer losses. Transformers losses come in two main categories;

1. Copper Losses
2. Core Losses

Copper losses are those that occur within the copper windings, both primary and secondary. There are three sub-categories of copper losses.

1. I2R Losses () – Heat losses in windings
2. Primary losses occur under *power*.
3. Secondary losses occur under *load*.

Core losses are those that occur within the permeable soft iron core that manipulates the electromagnet lines of force. There are three sub-categories of copper losses.

1. Eddie Current losses
2. Hysteresis
3. Flux leakage

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

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

**Transformer**



**Instructions**

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

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 512.821VA | 2.137A |  | 240V | 12 |
| S | 500VA | 25A | 800mΩ | 20V | 1 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 1.01kVA | 4.856A |  | 208.011V | 1.733 |
| S | 1kVA | 8.333A | 14.4Ω | 120V | 1 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 1.375VA | 12.5mA |  | 110V | 1 |
| S | 1.2VA | 5.455mA | 40.333Ω | 220V | 2 |

Where;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | S | I | R | E | N |
| P | 130VA | 5.417A |  | 24V | 1 |
| S | 120VA | 5A | 4.8Ω | 24V | 1 |