Experiment No.(3)

Resistive Load Test of Single-Phase Transformer

1 Objective

The load test is conducted to determine the voltage regulation and efficiency of small transformers.

2 Theory

The indirect method is typically used to determine the efficiency and regulation of large transformers, as it is not practical to perform a load test on these transformers. However, the load test can be used with small transformers, since the provisions of test facilities and the dissipation of the load energy are available.

The efficiency is determined directly from the measurements of input and output powers, that is:

$$\text{Efficiency} = \frac{\text{Output power}}{\text{Input power}}$$

If the applied primary voltage is kept constant, then the terminal voltage will vary with the load and the regulation is given by:

$$\text{Regulation} = \frac{V_{20} - V_2}{V_{20}} \times 100\%$$

Alternatively:

$$\text{Regulation} = \frac{IR_{eq}\cos\phi + IX_{eq}\sin\phi}{V_{20}} \times 100\%$$

Where:

V_{20} = secondary no-load voltage

V_2 = secondary load voltage

3 Procedure

Step 1: Connect the equipment as shown in fig (1&2). Use current transformers, if necessary, for the measurement of power and power factor in the secondary circuit. The input voltage should be kept constant at 220V and load resistance 48 ohm.

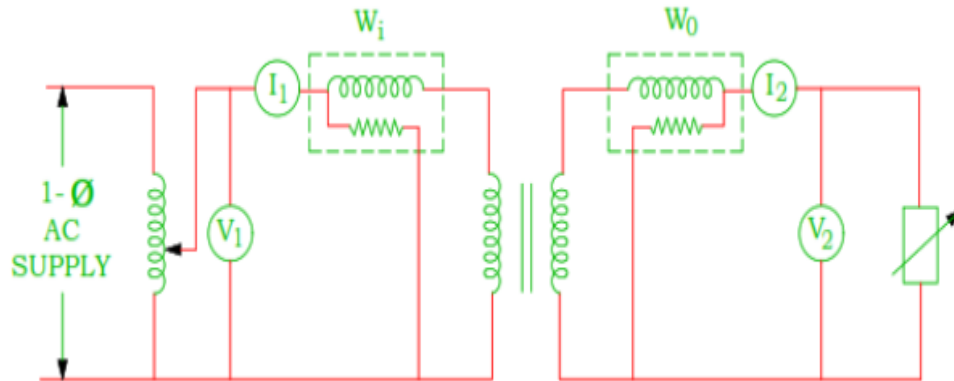**Note:** the secondary voltage V_{20} no-load and all instrument readings load.

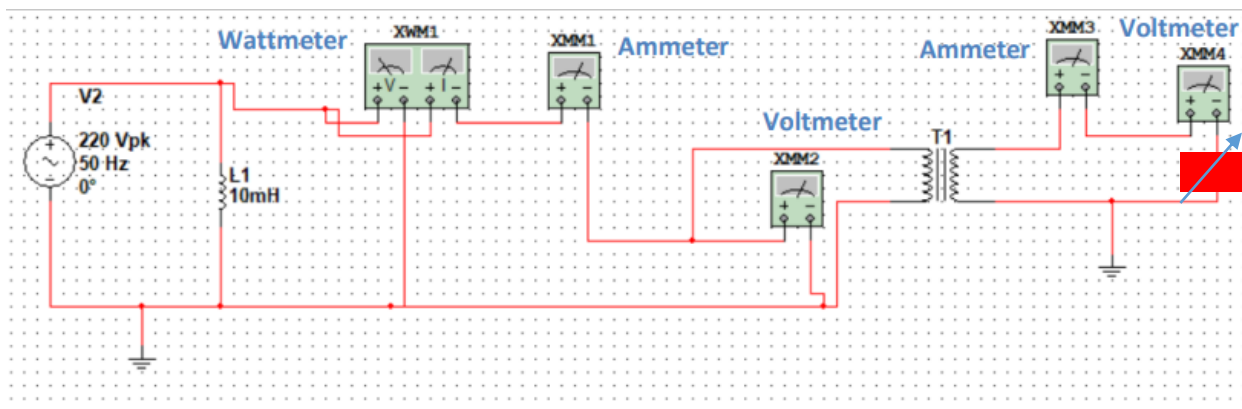Fig.1 Loaded Single phase transformer

Fig. 2 Multisim resistive test 1-phase transformer

Step 2: Connect the resistive load and take readings of all instruments while the load current is increased in step up to 125% rated current.

4 Calculation and Graph

1. Plot V_2 against I_2 for all loads.

2. Calculate regulation for different p.f. at rated current I_2.

3. Calculate and plot efficiency against I_2 for all loads.

4. Determine power factor for zero regulation.

5 Discussion

1. Discuss the graphs and results of the experiment.
2. Draw the simplified phasor diagram for unity, 0.8 lagging and 0.8 leading power factor at rated secondary current.