West Virginia University Lane Department of Computer Science and Electrical Engineering

Experiment #7 Load Characteristics and Equivalent Circuits

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Date Performed: 10/18/23

Due Date: 10/25/23

Table of Contents:

Lab Handout:

No lab hand out.

Objective & Equipment List for Each Experiment:

Objective:

The objective for this lab was to observe the behavior of the transformer with respect to different types of load. In this lab we tested no load, purely resistive load, inductive load and capacitive load. In the last part of the lab we worked on building equivalent circuits for a transformer.

Equipment:

- wires
- Multimeter unit
- Transformer unit : L2 was used

Procedure & Wiring Diagram

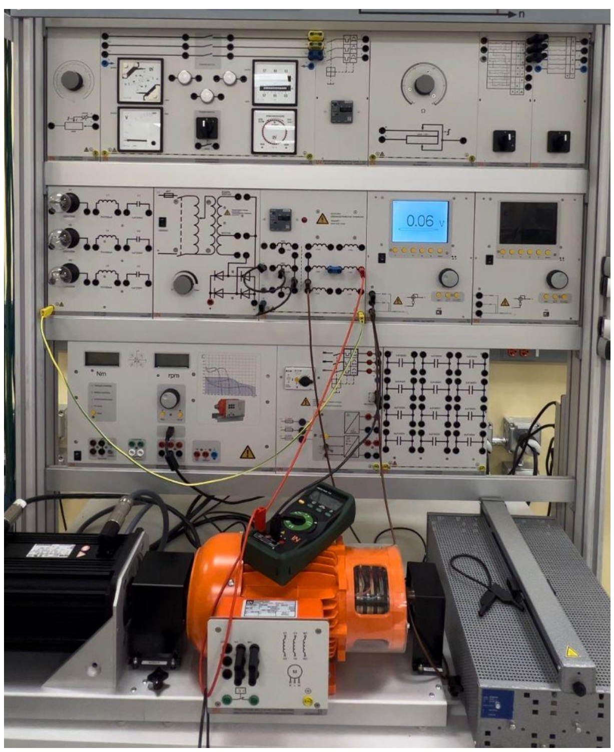

Figure 1. No Load Workbench

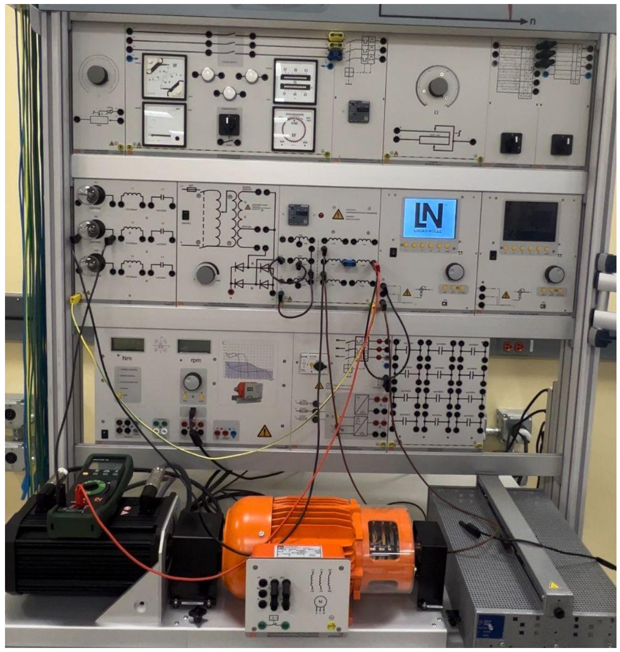

Figure 2. Resistive Load Workbench

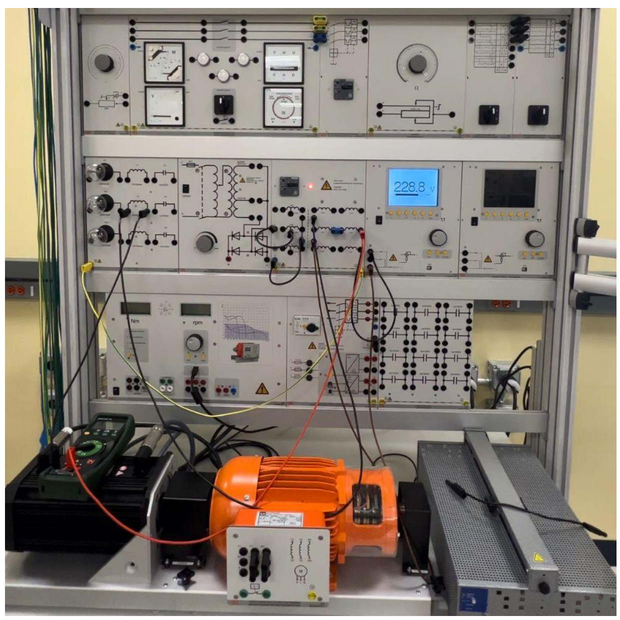

Figure 3. Inductance Load Workbench

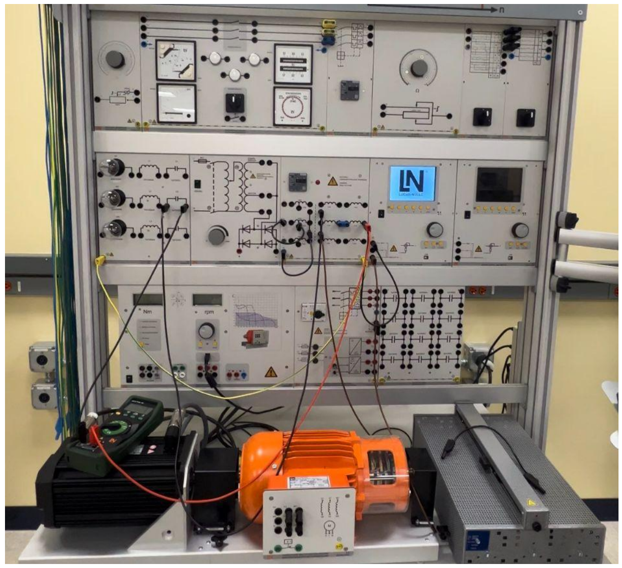

Figure 4. Capacitance Load Workbench

Figure 5. No Load Transformer Characteristics Workbench

Observations and Conclusions (And theory):

Experiment 1 No Load:

In this experiment, no load was connected to the secondary side of the transformer. The windings were pretty much shorted through the multimeter. The resistance on the multimeter read 0.002 Ω which can be taken as 0 Ω. The secondary voltage was: 241.07 V and the secondary current was: 0.01 mA. This configuration had the least amount of current. Since there is no load and no power being absorbed or lost minimal current passes through the secondary side.

Experiment 2 Resistive Load :

In this part, the secondary terminals of the transformer are passed through the bulb. The bulb served as a purely resistive load. The resistance of the bulb was measured to be 176.6 ohms. The secondary voltage was: 217.8 V and the secondary current was 100.8 mA. In this configuration the least voltage and greatest current was observed. This can be explained by the load being purely resistive and using power loss equation I^2(R) , a greater amount of current is used.

Experiment 3 Inductive Load:

In the experiment, the primary terminal stays the same; however, the secondary terminal of the transformer passes through the inductive region. After, the input voltage and output current were measured to be 229.4 V and 79.4 mA respectively. These were of the secondary winding values and corresponded well with what the measurements should be as our software "LabSoft X" deemed them correct for this experiment. The inductive load saw less current because although it has a greater apparent power than the resistive load, it has much less real power being dissipated. This is why the current flowing through it is fairly less.

Experiment 4 Capacitive Load:

In this final part of analyzing transformer behavior based on load, the capacitor on the workbench was connected to the secondary side of the transformer. The input voltage was 253.5 V and the output current was 96 mA. These came from the secondary side inputting these values into our software "LabSoft X" were deemed correct for the experiment. Capacitive loads generally have higher apparent power and slightly less real power compared to the purely resistive load. That helps to explain why the current flowing through the capacitive load was slightly less than the purely resistive load but greater than the inductive load.

Experiment 5 No Load Transformer Characteristics :

The goal of this experiment was to measure variables from a no load transformer circuit and use the values found to find resistive and inductive components as well as complex impedance from the primary side. Due to our computer issues we were not able to complete the whole experiment but still were able to find the readings from the workbench, calculate the power factor, and the angle of the phase difference of the voltage and current on the primary side. The voltage, current, power, and apparent power are as follows: 121.3 V, 0.03 V, 1.8 W, and 3.9 VA. The power factor is 0.4615 and the angle is 62.51° which means the current lags the voltage. This makes sense because if you have inductance the current should lag which it does.

PDFs of Experiment on LabSoft X