

ECE 370 POWER & ENERGY SYSTEMS

Transformer equivalent circuit model

The objective of the pre-lab for Lab # 4 is to develop a computer program that will calculate the "**approximate**" equivalent circuit for a 1 ϕ two-winding transformer. The input data consists of the following:

- The kVA rating and voltage ratings of the transformer.
- The nominal power factor of the load.
- The results of the open-circuit and short-circuit tests.

The program must output the following information:

- The approximate equivalent circuit parameters.
- Percent voltage regulation and efficiency (two graphs) vs kVA loading, as the load is varied from zero to 200% full-load, while load pf and load voltage are held constant at their nominal values.

Use the results from the in-class examples to confirm that the program is working correctly.

The programming language is your choice, and you can use any device for plotting the graphs, e.g., maple, matlab, quattro, excel etc.

The formal report for Lab # 4 will consist of a user's manual for your program that will contain the test data taken in the lab. Write the report as though you were working in your first job after graduation and your program had been developed to enable non-engineers in your department to analyze power-related problems, i.e., you should explain what data is needed and how to run the software. Assume the person using the program is technically oriented, but may not have an electrical engineering degree. A suggested format for the report is:

- Summary - what is in the report (not what you did in the pre-lab or lab). **Write this after you have finished the report.**
- Introduction - Background theory, do not go into excessive detail, assume the reader is technically oriented but needs to be reminded about transformer basics.
- User Guide - a brief description of what the program does and what the user has to do to make it work. Include a copy of the code as an appendix.
- Results. **Remember to output the equivalent circuit parameters.** Then present the regulation and efficiency graphs with the benchmark readings taken in lab marked on them. Make the graphs **large enough** to accurately read the points (**at least half a page per graph**). **Plot both graphs on a 0 - 0 axis.** Comment on their accuracy.
- Conclusion - suggest how the program can be used as one step in a larger study, which has to optimize transformer application.

Due dates (due at the end of the day)

- i) Friday 3/24/17 – a listing of code and preliminary results; which may, or may not, be in error.
- ii) Tuesday 3/28/17 – a working program with correct results.
- iii) Monday 4/17/17 – formal report.