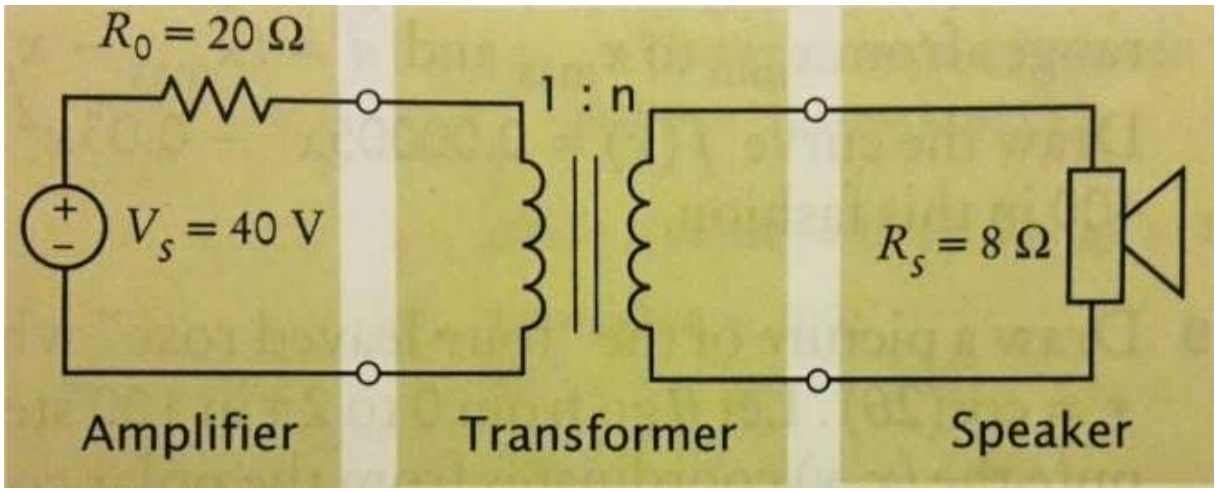
LAB EXAM 6

Section 2

Mar. 29, 2016

In this lab assignment, you are going to write a program calculates the power that is delivered to speakers in a circuit.

The example figure below illustrates a situation that occurs in various audio devices such as cell phones and music players. In this circuit, a transformer is used to connect a speaker to the output of an audio amplifier.



The symbol used to represent the transformer is intended to suggest two coils of wire. The parameter ***n*** of the transformer is called the **"turns ratio"** of the transformer.(The number of times that a wire is wrapped around the core to form a coil is called the number of turns in the coil. The turns ratio is literally the raito of the number of turns in the two coils of wire.)

When designing the circuit, we are concerned primarily with the value of the power delivered to the speakers – that power causes the speakers to produce the sounds we want to hear. Suppose we were to connect the speakers directly to amplifier without using the transformer. Some fraction of the power available from the amplifier would get the speakers. The rest available power would be lost in the amplifier itself. The transformer is added to the circuit to increase the fraction of the amplifier power that is delivered to speakers.

The power, P_S, delivered to the speakers is calculated using the formula;

$$P_s = R_s \left(\frac{nV_s}{n^2 R_0 + R_s} \right)^2$$

Write a program that models a circuit and varies the turns ratio from 0.01 to 2 in 0.01 increments, then determines the value of the turns ratio that maximizes the power delivered to the speakers.

Firstly your program should display following prompts;

```
Please enter R0 value of Amplifier in ohms(R0):
Please enter Vs value of Amplifier in volts(Vs):
Please enter Rs value of Speaker in ohms(Rs):
```

When the user enters R_0, V_S and R_S values, the program will compute the value of **the turns ratio** that maximizes the power delivered to the speakers and prints out on console. Please refer to the sample run for details:

Sample Run:

```
Please enter R0 value of Amplifier in ohms(R0): 20
Please enter Vs value of Amplifier in volts(Vs): 40
Please enter Rs value of Speaker in ohms(Rs): 8
Optimal turn ratio is 0.6300000000000003
Do you want to continue? (Y/N): Y

Please enter R0 value of Amplifier in ohms(R0):30
Please enter Vs value of Amplifier in volts(Vs):60
Please enter Rs value of Speaker in ohms(Rs):16
Optimal turn ratio is 0.7300000000000004
Do you want to continue? (Y/N): N
```

You should implement two classes named 'Transformer' and 'TransformerTest'.

In Transformer class you should include a constructor which takes R_0, V_S, n and R_S values as parameters. You should include a method named '**public double optimalTurnRatio()**', which computes and returns the optimal turn ratio.

In TransformerTest class, your program should create an instance of the Transformer class for each calculation, and at the end of each calculation, the program should ask whether the user wants to continue or not. The program will continue until the user enters "N" as input.

Note that this is an exam. You are not allowed to communicate with any person other than your teaching assistant. Those who do not obey this rule will be subject to disciplinary investigation. You can use only the features (techniques, classes, methods and statements) that are covered in the class. After finishing your work, select your folder (e.g. Lab06), then right click and select “Send to” option. Click “Compressed (zipped) folder”. Rename your zip file as “Lab06_Surname_Name”. Note that, your file type is “zip”, namely your file name will not be “Lab06_Surname_Name.zip”. Upload your zip file to Unilica. Note that you must upload your file before 16:40; you cannot upload your file after that time.