

Homework 1: Basics of Electrical Circuits

General Instructions: The report should contain answers to the questions in the task and a short description of every step in your solution. It is also possible to present in a jupyter notebook format, where solution description is in the notebook. The logic of the solution to the problem and all notations should be clear. Each student has a different data for the problem. The report (word or pdf file) should be submitted by what's the deadline?

Concepts Covered: Kirchoff law, Ohm law

Name: _____

Problem 1 [100 points]

Consider the AC electrical circuit on Fig. 1 Three loads, connected in parallel, are connected to the voltage source ($V = 16\angle 0$) via line with parameters R_{line} , X_{line} . Load parameters are. The values of parameters of line and loads can be found in table and are individual for each student.

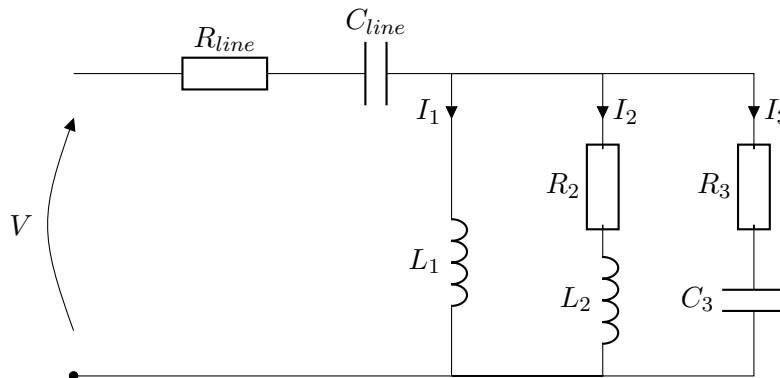


Figure 1: Circuit

- (a) (10 pt) Write the complex impedance of every load in rectangular and polar forms.
- (b) (10 pt) Calculate the complex equivalent impedance of the whole circuit.
- (c) (10 pt) Calculate the complex current in the line.
- (d) (10 pt) Calculate the voltage drop in the line.
- (e) (10 pt) Calculate the complex load voltage.
- (f) (10 pt) Calculate complex currents I_1, I_2, I_3 .

- (g) (**10 pt**) Calculate instantaneous currents i_1, i_2, i_3 and instantaneous voltage v_1, v_2, v_3 .
- (h) (**15 pt**) Calculate the apparent, real and reactive power consumed by every load.
- (i) (**15 pt**) Calculate the sending apparent, real and reactive power.