Bialystok University of Technology
Faculty of Electrical Engineering
Department of Electrotechnics, Power Electronics
and Electrical Power Engineering

Instruction
for a specialistic workshop on
Electrical Circuits 2
Subject code: **IS-FEE-10085S**
(Erasmus+)

PSPICE PROGRAM.
AC CIRCUIT SIMULATION.

Instruction Number

EC2_01

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Contents

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Teaching Materials for Students of the Faculty of Electrical Engineering at BUT.

1. Workstation Description

1.1. Equipment used

A PC-class computer with the Microsoft Windows 10 operating system is used during classes.

1.2. Software

The computers are equipped with the PSpice program.

2. Exercises Procedure

Complete the tasks below and prepare a report on the activities according to the provided instructions.

1. Enter the electrical circuit shown in the figure into the PSpice program. Assume the following circuit parameters: $u(t) = 10\sin(2\pi ft)$, f = 50 Hz, R = 50 Ω, L = 200 mH, C = 200μF. Observe the current waveforms in the circuit and the voltage drops across individual elements.
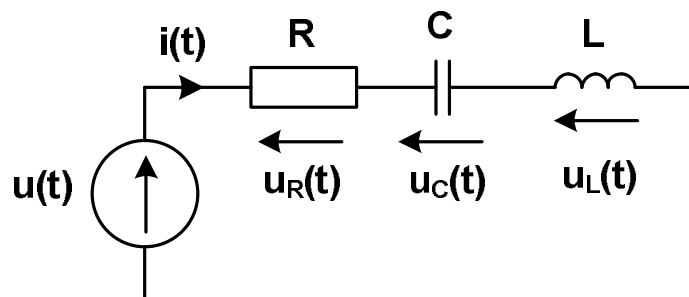
The report should include:

- a description of the purpose and scope of the task,
- an electrical circuit diagram from the PSpice program,
- a graph showing the current in the circuit and the voltage across the resistor (two signal periods),

- a graph showing the current in the circuit and the voltage across the inductor (two signal periods),
- a graph showing the current in the circuit and the voltage across the capacitor (two signal periods),
- conclusions discussing whether the obtained results comply with the theory.

2. Perform a parametric analysis of the electrical circuit from task no. 1 for:

   a) R = 50 Ω, R = 100 Ω, R = 150 Ω, R = 200 Ω,

   b) L = 200 mH, L = 400 mH, L = 600 mH, L = 800 mH.

   Observe the changes in circuit current.

   The report should include:

   - a description of the purpose and scope of the task,
   - an electrical circuit diagram from the PSpice program,
   - a graph showing the current in the circuit for each resistance value,
   - conclusions discussing whether the obtained results comply with the theory,
   - an electrical circuit diagram from the PSpice program,
   - a graph showing the current in the circuit for each inductance value,
   - conclusions discussing whether the obtained results comply with the theory.

3. Literature

[1]   Thomas R.E., Rosa A. J., Toussaint G.J.: The Analysis & Design of Linear Circuits. 8th Edition. Wiley Inc., 2016.

[2]   Tung L.J., Kwan B.W.: Circuit Analysis. World Scientific, 2001.

[3]   Irvin J.D., Nelms R.M.: Basic Engineering Circuits Analysis. International Student Version. John Willey&Sons Inc., 2008.

[4]   https://www.electrical4u.com/electrical-engineering-articles/circuit-theory

[5]   https://www.khanacademy.org/science/electrical-engineering

4. Health and Safety Requirements

To begin the practical part of the exercise, it is mandatory to familiarize yourself with the health and safety instructions and fire safety guidelines and to adhere to the rules contained therein.

During laboratory sessions, the following rules must be observed:

- Verify that the devices available at the laboratory workstation are complete and show no signs of physical damage.
- If possible, adjust the workstation conditions to suit individual ergonomic needs. Position the computer monitor to ensure constant and comfortable visibility for all team members.
- Check the correctness of device connections.
- The computer may only be turned on with the instructor's permission.
- Eating and drinking are prohibited while working with the computer.
- Upon completion of work, log out before leaving the workstation. The operating system may only be shut down upon explicit instruction from the instructor.
- Making any modifications, switching components, or replacing elements of the workstation is strictly prohibited.
- Changing the computer's configuration, including the operating system and software, is not allowed unless it is part of the class program and performed under the instructor's supervision.
- In the event of a power failure, immediately turn off all devices.
- Any missing equipment or malfunctions must be reported to the instructor.
- It is forbidden to operate, manipulate, or use devices not included in the current exercise.
- In case of electric shock, immediately disconnect the workstation from the power supply. Do not touch the affected person before the power is turned off.