

**BACHELOR OF COMPUTER SCIENCE
SCHOOL OF COMPUTER SCIENCE
BINA NUSANTARA UNIVERSITY
JAKARTA**

ASSESSMENT FORM

Course: SCIE6063001– Computational Physics

Method of Assessment: Case Study

Semester/Academic Year : 1/2024-2025

Name of Lecturer : Fabian Surya Pramudya, B.Sc., M.Sc., Ph.D.

Date : 04 September 2024

Class : Mathematics

Topic : Voltage and Current, Resistance and Capacitance, Induction and inductance, Electromagnetic Oscillation and Alternating Current

Group Members :	1
	2
	3
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Student Outcomes:

(SO 1) Mampu menganalisis masalah komputasi yang kompleks dan mengaplikasikan prinsip komputasi dan keilmuan lain yang sesuai untuk mengidentifikasi solusi.

Able to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions

Learning Objectives:

(LObj 1.2) Mampu menerapkan prinsip komputasi dan disiplin ilmu terkait lainnya untuk mengidentifikasi solusi

Able to apply principles of computing and other relevant disciplines to identify solutions

No	Assessment criteria	Weight	Excellent (85 - 100)	Good (75-84)	Average (65-74)	Poor (0 - 64)	Score	(Score x Weight)
1	Ability to design a computational simulation of basic electrical circuits using Python Power Electronic	25%	The design is correct and can work well without errors	The design is correct and can work well with some errors.	The design is correct but cannot work well	The design is incorrect and cannot work well		
2	Ability to explain the concept and real-world application of Resistance and Capacitance, dan Circuits Design and Analysis	25%	The steps are complete and the explanations are clearly stated.	The steps are complete and the explanations are well stated	The steps are not complete and the explanations are less appropriate.	The steps are not complete and the explanations are inappropriate		
3	Ability to solve problems in topics of Circuits Design & Analysis, Induction and inductance, and Electromagnetic Oscillation and Alternating Current	25%	Able to solve in both numerical and computational approaches well	Able to solve in both numerical and computational approaches well with some errors.	Able to solve in either numerical or computational approaches well with some errors	Unable to solve in either numerical or computational approaches		
4	Analyze the computational simulation result of Voltage and Current, Resistance and Capacitance, Circuits Design & Analysis to create scientific reports	25%	The steps are complete and the explanations are clearly stated.	The steps are complete and the explanations are well stated	The steps are not complete and the explanations are less appropriate.	The steps are not complete and the explanations are inappropriate		
Total Score: $\sum(\text{Score} \times \text{Weight})$								100

Remarks:

Individual Assignment

The case below is an open-ended problem, which has multiple answers. Answer these problems in the combination of numerical approach and computational approach using Python Power Electronics. Beside your numerical answer, attach your circuit topology, parameters, and simulation output graph. **Submit your answer in as a single .PDF file**

ASSESSMENT METHOD

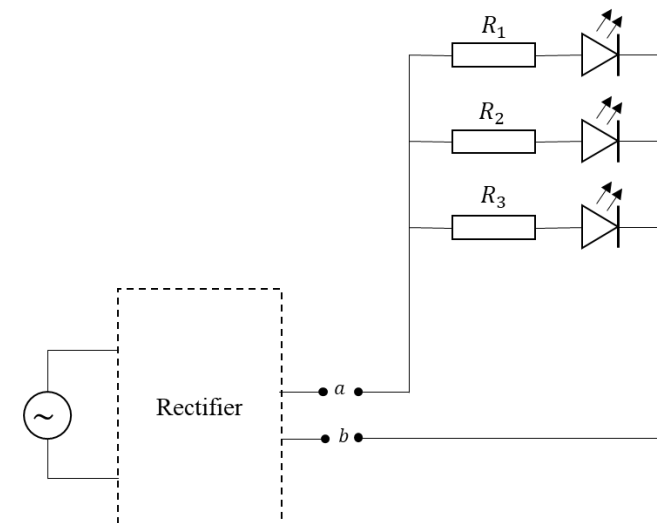
Instructions

Case Study Problem

You are planning to conduct a small electronic project. You are planning to make a simple LED circuit (see diagram). The circuit contains three green LED lights that connected using parallel connections. From the LED specification sheet, you know that the LED will works on a minimum voltage of 2 V . Also, you gain information that the LED will break if the current that flow through it exceed 20 mA . For that, you need to use some resistor to limit the current that flow through the LED.

To power the circuit, you are planning to use a micro hydro generator that you already have. However, you realize that you need to convert the current from AC to DC so you can light up the LED. But you don't have the proper converter at the moment. So, you decide to make your own rectifier, **a basic RLC rectifier**, from only the components you have (see table) at hand. Assume that your component supply is large enough, so you can use any number of each component.

Assume that your LED does not have any internal resistance. The LED circuit will be connected to the rectifier at point a and b (see diagram). The generator has an output of 5 V with frequency of 20 Hz . **So, what is your solution for the basic RLC rectifier?** Assume that each component on the table (including the EMF) has internal resistance of $0.1\ \Omega$.



No	Component	Value
1	Resistor	$3\ \Omega$
2		$24\ \Omega$
3		$36\ \Omega$
4		$100\ \Omega$
5		$130\ \Omega$
6		$220\ \Omega$
7		$510\ \Omega$
8	Capacitor	$1.0\ \mu F$
9		$3.3\ \mu F$
10		$22\ \mu F$
11	Inductor	$2\ \mu H$
12		$5.1\ \mu H$
13		$2\ mH$
14		$400\ mH$

- [LO3 25%]** Submit your topology plan for the RLC rectifier circuit
- [LO2 25%]** Provide a brief explanation of the reason you chose the component set.
- [LO1 25%]** Submit the value of each of the components that you are using, including the numerical reason why this setting will work.
- [LO4 25%]** Submit your modeling output graphs using Python Power Electronics to prove that your setting comply to the minimum voltage and maximum current requirements.

Note for Lecturers:

- The lecturers are advised to assess student's understanding towards the topics included in the assignment.
- The students will submit their answer in .PDF format through BINUS Maya.
- The deadline of this comprehensive assignment is at the end the semester.