Laboratory 1 (1 day): Linear circuits

Overall notes:

- This laboratory has ***one session*** allocated for completion
- All students are to deliver a lab report by the submission deadline

Answer the questions below

1. Consider the following: We apply a voltage and a current may result. Can we consider this as a cause-and-effect scenario? Can we consider this as a stimulus-and-response scenario? Can we consider this as an input-and-output scenario?

Resistor

2. What is the function of a resistor? Give the current-voltage characteristic of a resistor.
3. Consider applying a voltage and we consider the voltage to be a cause and the resulting current to be the effect. Cause = 0 ⇒ Effect = 0? Is the effect proportional to the cause? Is a resistor a linear circuit element?

Capacitor

4. What is the function of a capacitor? Write the equation giving the impedance of a capacitor. Give the current-voltage characteristic of a capacitor.
5. Consider applying a voltage and we consider the voltage to be a cause and the resulting current to be the effect. Cause = 0 ⇒ Effect = 0? Is the effect proportional to the cause? Is a capacitor a linear circuit element?

Inductor

6. What is the function of an inductor? Write the equation giving the impedance of an inductor. Give the current-voltage characteristic of an inductor.
7. Consider applying a voltage and we consider the voltage to be a cause and the resulting current to be the effect. Cause = 0 ⇒ Effect = 0? Is the effect proportional to the cause? Is an inductor a linear circuit element?

Power sources

8. Is a voltage source a linear circuit element?
9. Is a current source a linear circuit element?
10. Conversion of DC power sources: Can we transform any voltage source into a current source? Can we transform any current source into a voltage source?

Superposition principle

11. What is it?
12. When can we apply it?
13. How do we apply it?

Forward-looking questions

14. What is a diode? What is the *IV* characteristic of a diode?
15. What is the turn-on voltage (also called threshold or knee voltage) of a Si diode? Is a diode a linear circuit element? What is the mathematical function of a diode's *IV* characteristic?
16. Can you experimentally verify any of your statements?
17. Can you confirm any of your statements by simulation (Spice)?