

# Problem Set 04: Reactive Energy Analysis

BME253L - Fall 2025

2025-09-29

Please complete the following problems and tasks, and upload your solutions to Gradescope, using the [formatting guidelines](#) below.

1. In the circuit shown below, let:

$$i(t) = \begin{cases} 0, & t < 0 \\ t, & 0 \leq t < 10s \\ 10, & t \geq 10s \end{cases}$$



- a. Plot the energy stored in the inductor for all time.
  - b. On the same plot, plot the energy delivered by the source for all time.
2. In the circuit shown below, let:

$$v(t) = \begin{cases} 0, & t < 0 \\ t, & 0 \leq t < 10s \\ 10, & t \geq 10s \end{cases}$$



- a. Plot the energy stored in the capacitor for all time.
  - b. On the same plot, plot the energy delivered by the source for all time.
3. Find the energy stored in each capacitor and inductor in the circuit below, under steady-state DC conditions.



4. Find the energy stored in each capacitor and inductor in the circuit below, under steady-state DC conditions.



## Problem Set Format Guidelines

Please follow these guidelines when completing your problem sets to insure accurate grading and to reduce time to troubleshoot problem solving.

- Each problem should be on dedicated pages that will be able to be uniquely selected on Gradescope to associate with specific questions (i.e., do not have multiple problems on the same page).
- For problems that involve circuit analysis, make sure that you clearly present an annotated circuit to show what variables correspond to what quantities in the analysis.
  - Label all circuit elements with symbols.
  - Solve problems symbolically before substituting in numerical values.
- Please write legibly and include all relevant steps in arriving at your solution.
- Please place a box around all final solutions.

### ! Important

All answers must have units!! No units = no credit!

- Attach any computer code (e.g., Python code) used to solve problems and generate plots.
  - This should be done with a Jupyter notebook.
  - Ideally your code should “self described” your thought process, but if unclear, add comments in the code where appropriate to indicate your thought process.
- All plots must be appropriately labeled with units.
- Problem sets must be scanned and converted to PDFs, uploaded to Gradescope, and have each problem associated with the specific question in Gradescope.

### ⚠ Warning

Failure to associated pages of your PDF with specific problems in Gradescope will result in loss of credit for that question.