

ee101_rlc_1.sqproj

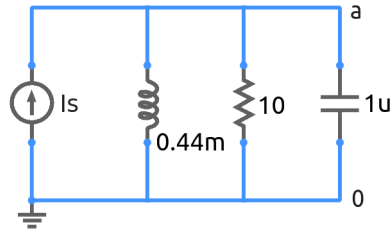


Figure 1: Parallel RLC circuit with a current step input.

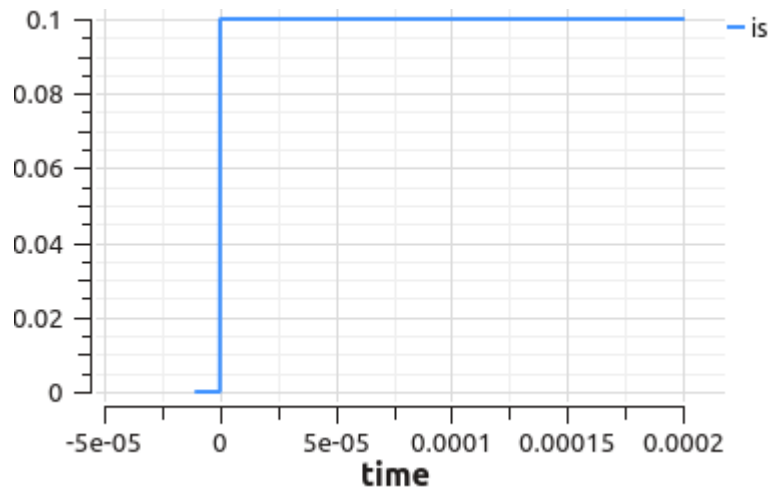


Figure 2: Current step input.

Consider the parallel RLC circuit shown in Fig. 1. A current step input as shown in Fig. 2 is applied.

Exercise Set

1. From KCL, obtain a second-order differential equation in $V(t)$ describing the circuit for $t > 0$ (where $V(t)$ is the voltage across the parallel combination).
2. Write the corresponding characteristic equation and find its roots.
3. Write the general form of the solution for $V(t)$.
4. Find the conditions $V(\infty)$, $V(0^-)$, $i_L(0^-)$.

5. Note that $V(0^+) = V(0^-)$, and $i_L(0^+) = i_L(0^-)$. Find $\frac{dV}{dt}(0^+)$.
6. Substituting $V(\infty)$, $V(0^+)$, and $\frac{dV}{dt}(0^+)$, find the constants in your general solution.
7. From $V(t)$, obtain expressions for $i_R(t)$, $i_L(t)$, $i_C(t)$.
8. Sketch $i_R(t)$, $i_L(t)$, $i_C(t)$, $i_s(t)$ for $-0.1 \text{ ms} < t < 0.2 \text{ ms}$.
9. Compare your answers with simulation results.