Dept. Electrical and Computer Engineering
The University of British Columbia
EECE560 Network Analysis and Simulation January 2021
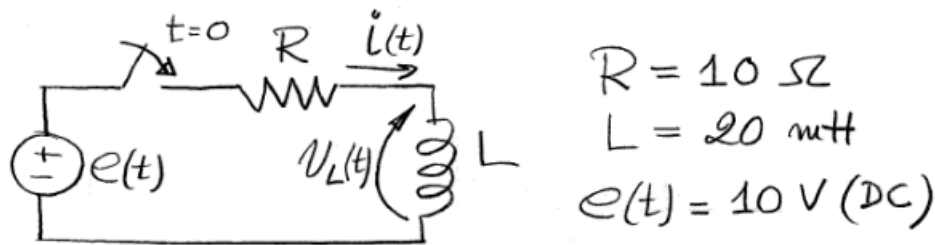Instructor: Dr. J. R. Martí

ASSIGNMENT No. 1a

Due Date: 22 January 2021
Basic Circuit Discretizations

Consider the simple RL circuit shown below.

A step function $e(t)$ is applied at $t = 0$. Solve the circuit for $i(t)$ and $v_L(t)$ from $t = 0$ to $t = 10\,\text{ms}$ as follows:

1. Solve (by hand) the differential equation of the continuous time system in terms of the homogeneous plus steady-state solutions.

2. Discretize the circuit and write a computer program to obtain the step-by-step solution in the following cases:

   (a) Using the trapezoidal rule with $\Delta t_1 = 0.1\,\text{ms}$.

   (b) Using the backward Euler rule with $\Delta t_1 = 0.1\,\text{ms}$.

   (c) Using the trapezoidal rule with $\Delta t_2 = 0.8\,\text{ms}$.

   (d) Using the backward Euler rule with $\Delta t_2 = 0.8\,\text{ms}$.

3. Plot (a) and (c) on the same graph. Plot (a) and (b) on the same graph. Plot (c) and (d) on the same graph.

4. Make sure all graphs have labels that identify the variables and conditions.

5. Suggest possible improvements in your solution with respect to the basic solution method explained in class.