

Lab 4

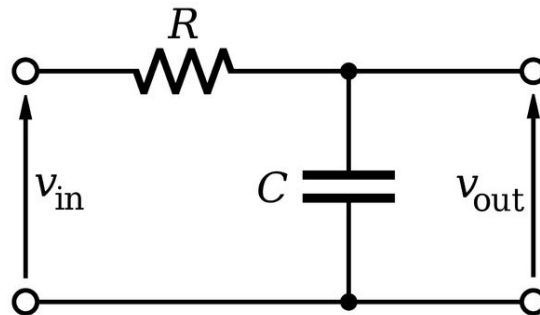
EE 324: Signals and Systems II

In this Lab section we will compare several different representations of dynamical systems.

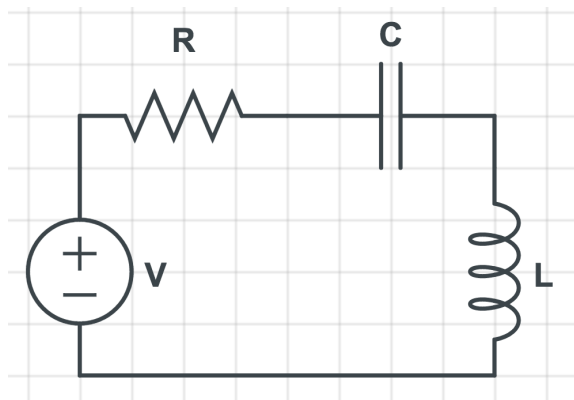
1 Prelab assignment

1. Get familiar with state space models (Chapter 2.13) <http://web.mit.edu/2.14/www/Handouts/StateSpace.pdf>
2. Learn to use transfer functions as well as state space models in simulink <https://www.mathworks.com/help/simulink/slref/transferfcn.html> <https://www.mathworks.com/help/simulink/slref/statespace.html>
3. Derive the transfer functions and state space models associated with the following systems

i) Input: v_{in} , output: v_{out}



ii) Input: v , output: voltage of R



2 Lab assignment

1. Compute the impulse response $h(t)$ of system (i) and then the response of system (i) with parameters $R = 500k\Omega, C = 1\mu F$, input $x = 1V$ and zero initial condition (Lab 3). Plot the result.
2. Simulate the response of system (i) with the same parameters using the transfer function module in simulink.
3. Simulate the response of system (i) with the same parameters using the state space module in simulink.
4. Compare 1, 2 and 3. You should get the same responses.
5. Simulate the response of system (ii) with parameters $R = 500\Omega, C = 1mF, L = 1H$, input $x = 1V$ and zero initial condition using the transfer function module.
6. Simulate the response of system (ii) with parameters $R = 500\Omega, C = 1mF, L = 1H$, input $x = 1V$ and zero initial condition using the state space module. Compare the result with 5.
7. Simulate the response of system (ii) with parameters $R = 500\Omega, C = 1mF, L = 1H$, input $x = \sin(2\pi t)V$ and zero initial condition using the transfer function module.
8. Simulate the response of system (ii) with parameters $R = 500\Omega, C = 1mF, L = 1H$, input $x = \sin(2\pi t)V$ and zero initial condition using the state space module. Compare the result with 7.