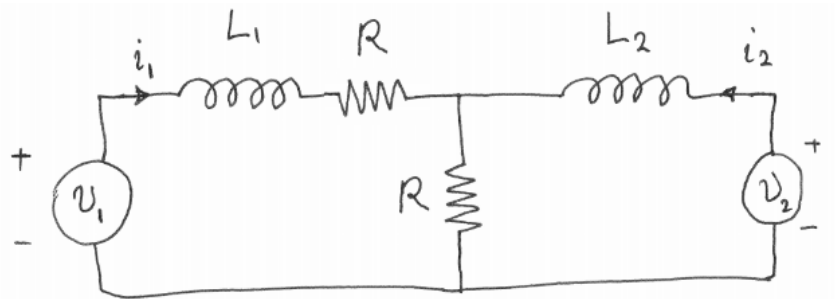


Homework Assignment #4 (ME-190, Fall 2016)

Due date: Thursday, Oct. 6, 2016, 2:00 pm.

Objective: Developing State Space Models for Dynamic Systems.

Problem 1. In the represented circuit diagram, v_1 and v_2 are independent input voltages, and i_1 and i_2 are the resulting output currents.



- (a) Write the governing differential equations for the system which relate outputs to inputs (You need to use KVL and KCL and come up with two differential equations, one for each loop, with variables being i_1 , i_2 , v_1 , and v_2).
- (b) Put the equations in the standard state-space form and find the corresponding A, B, C, and D matrices.
Hint: Choose the state variables to be the currents in the inductors.
- (c) Simulate the unit step response of the system in Matlab For $L1 = 0.1$ H, $L2 = 0.2$ H, and $R = 10 \Omega$ using the “step” command. You will get 4 plots, one from each input to each output. To create the state-space model in Matlab you can type “sysName = ss(A,B,C,D);”.

2. Repeat part (a)-(c) of the above problem for the following circuit diagram. Choose $C = 1000 \mu f$.

Hint: Choose the state variables to be the charges in the capacitors and the currents in the inductors.

