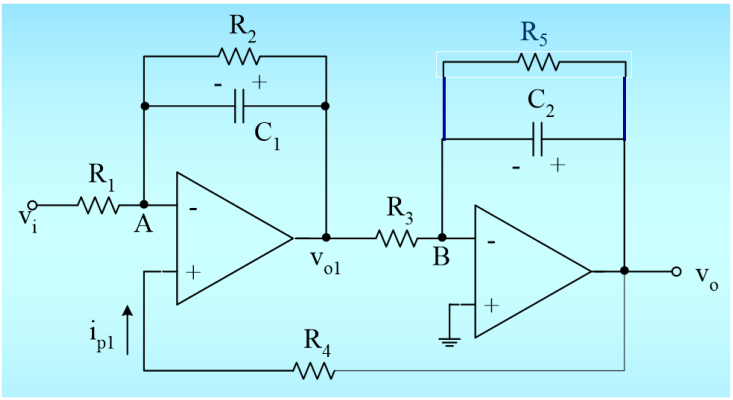
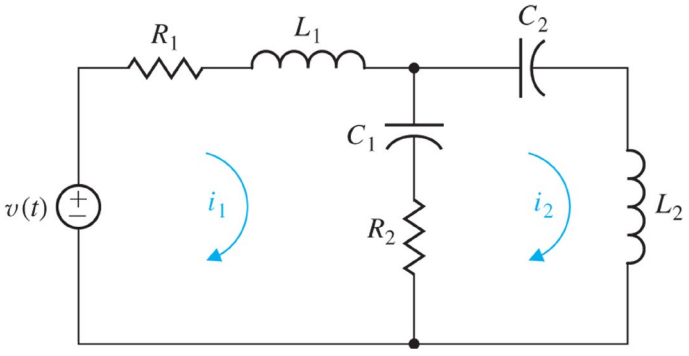
EE 475 HW #2

1. The book derived the transfer function of the PID controller given in Table 3-1 on page 85. Use this result to obtain the results given in item 3 and item 4 in the same table.
2. Derive the e_i to e_o transfer function for the Lag-lead controller given in item 7 of Table 3-1. Assume ideal op amps.
3. For the op amp circuit given below, vi is input, vo is output, vc1 and vc2 are state variables. Derive the state space model for the circuit.



4. B-3-7
5. B-3-9
6. B-3-11
7. B-3-12
8. B-3-13, take gear ratio = 1
9. For the electric circuit given below. Use v as input, i_1 and i_2 as output, and your choice of state variables to derive a state space model for the circuit. Get the transfer function from v to i_2.



10. A CMOS low noise amplifier (LNA) that is typically used in your cell phone is given below in the left half of the graph. There is also an R_L connecting from Vo to ground not shown. A simplified small signal circuit for the LNA is represented in the right half of the graph. V_s is input and V_o is output. 1) Identify the energy-storing elements. 2) Determine the state variables, the node to write KCL and the loops to write KVL. 3) Derive a state apace model for the low noise amplifier together with the load R_L.