Carleton University

Dept. of Systems and Computer Engineering

Systems and Simulations—SYSC 3600   Fall 2014

Homework #6

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1. In the circuit shown in Figures 1 and 2 the switch was open for a long time and at $t = 0$ it was closed. Obtain a mathematical model for the current $i(t)$. Assume that the initial voltage across the capacitor plates is equal to zero.
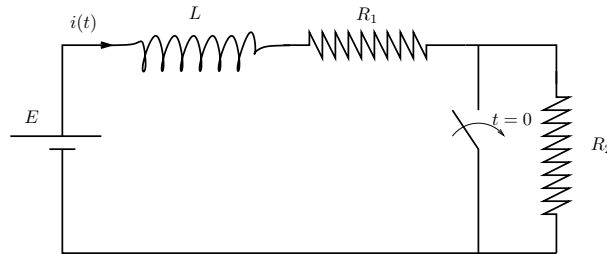

Figure 1: First order electrical system

2. Use loop analysis to find an expression for the voltage drop across the resistor R_1 in Figure 3. Assume zero initial conditions and further assume that $R_1 = R_2 = R_3 = 10$ Ohm, $C_1 = C_2 = 10\mu F$ and $L_1 = L_2 = 10mH$.

3. Find the transfer function $E_0(s)/E_i(s)$ for the circuit shown in Figure 4. Assume that $R_1 = R_2 = 50$ Ohm, $C_1 = C_2 = 2\mu F$ and $L_1 = L_2 = 1mH$

4. Use the force-voltage and the torque-voltage analogy to obtain an electrical circuit analogous to the mechanical systems in Figures 5 and 6.
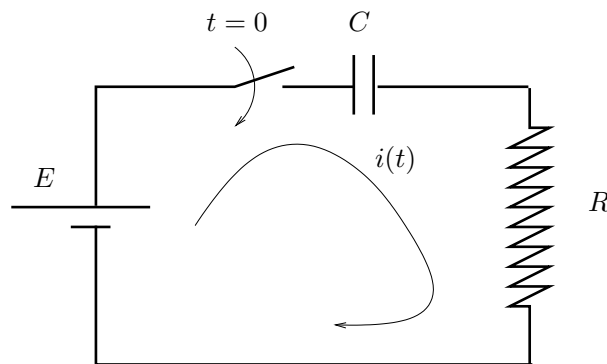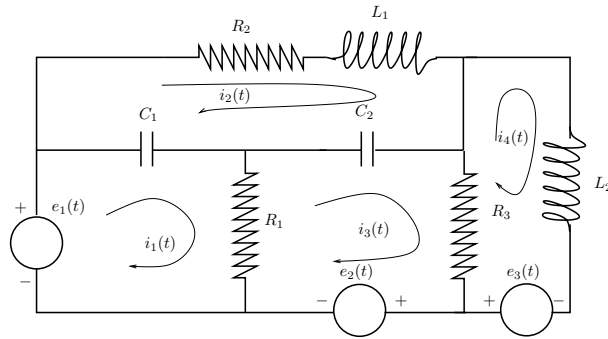

Figure 2: First order electrical system

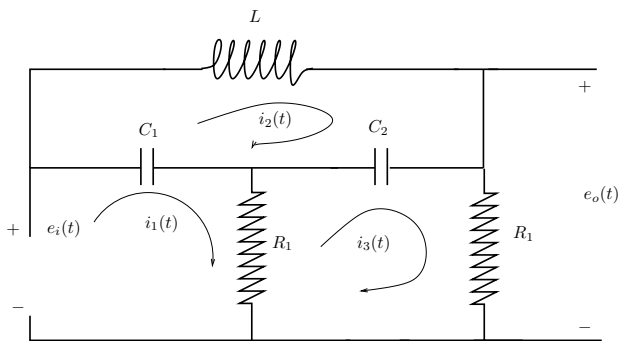Figure 3: Higher order electrical system—Loop analysis.
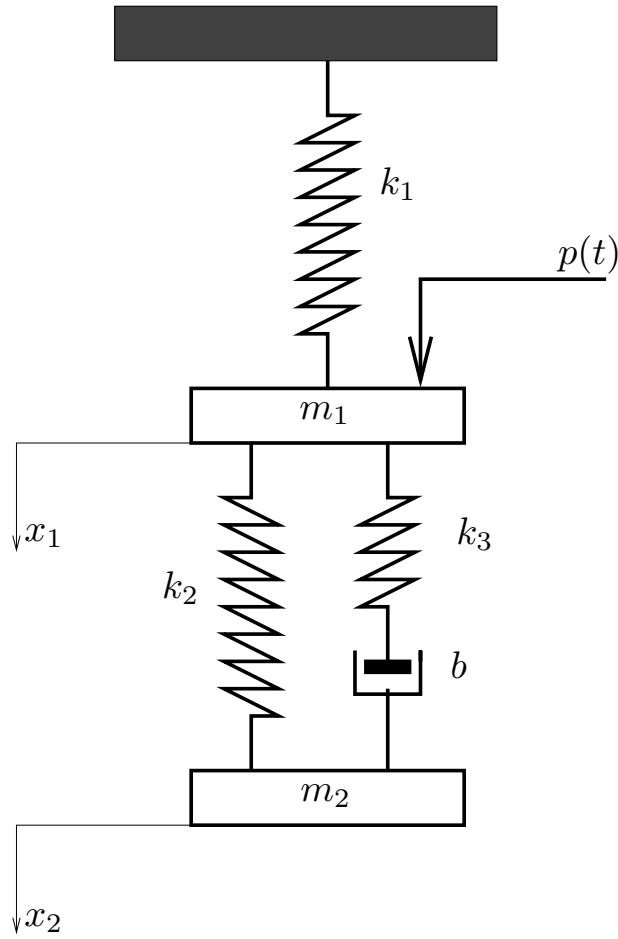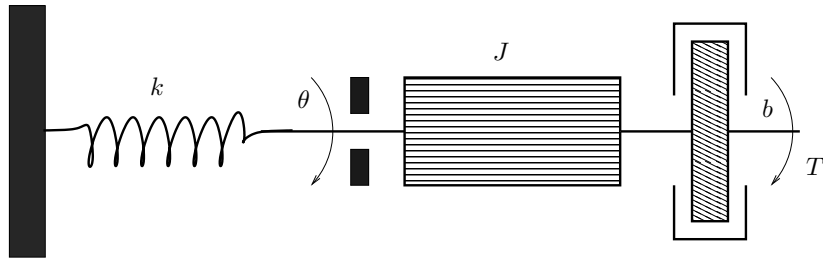

Figure 4: Higher order electrical system—Transfer function.

Figure 5: Analogous systems.

Figure 6: Analogous systems.