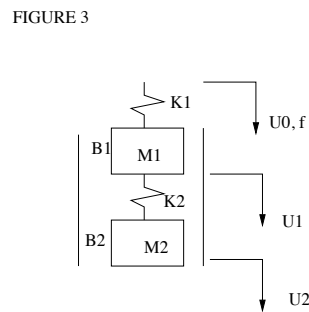
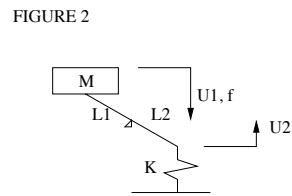
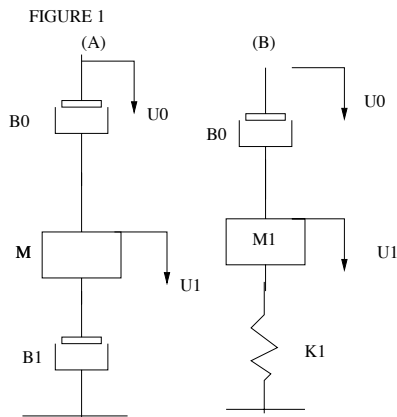


Department of Electrical and Computer Engineering
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EECE4130 Problem Set #1

1. Consider the mechanical system shown in Figure 1. The velocity of the masses are given by u . The variable k represents the mechanical stiffness, M the mass and b the damping coefficient.



- a. Using mobility analogy where the velocity as the "across" variable, determine the an equivalent circuit for the system.
- b. Determine the equations of motion in the Laplace-domain.
- c. Determine the equations of motion in the time-domain.
- d. Find the transfer function $U_1(s)/U_0(s)$.

2. Consider the mechanical system in Figure 2. The mass M is connected to the spring k by a lever where the length of the arms are given by L_1 and L_2 . The velocity are given by u and applied force by the variable f .

- a. Using mobility analogy where the velocity as the "across" variable, determine the an equivalent circuit for the system.
- b. Determine the equations of motion in the Laplace-domain.
- c. Determine the equations of motion in the time-domain.
- d. Find the transfer function U_2/U_1 .

3. Consider the mechanical system in Figure 3. Two masses connected by a spring k_2 are placed in a stationary rigid tube. The friction between the tube and the masses M_1 and M_2 is given the

b_1 and b_2 respectively. The velocity are given by u and applied force by the variable f .

- a. Using mobility analogy where the velocity as the "across" variable, determine the an equivalent circuit for the system.
- b. Determine the equations of motion in the Laplace-domain.
- c. Determine the equations of motion in the time-domain.
- d. Find the transfer function U_2/U_0 .