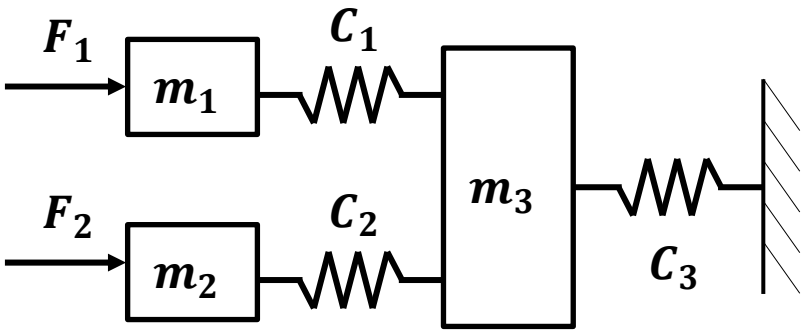
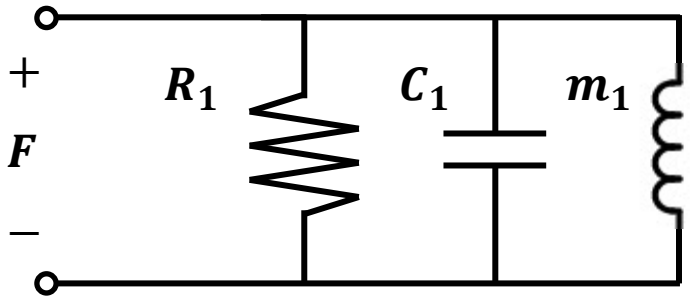
Homework Assignment:

1. Draw the equivalent circuits or systems of the following, and derive the impedance and admittance matrices:

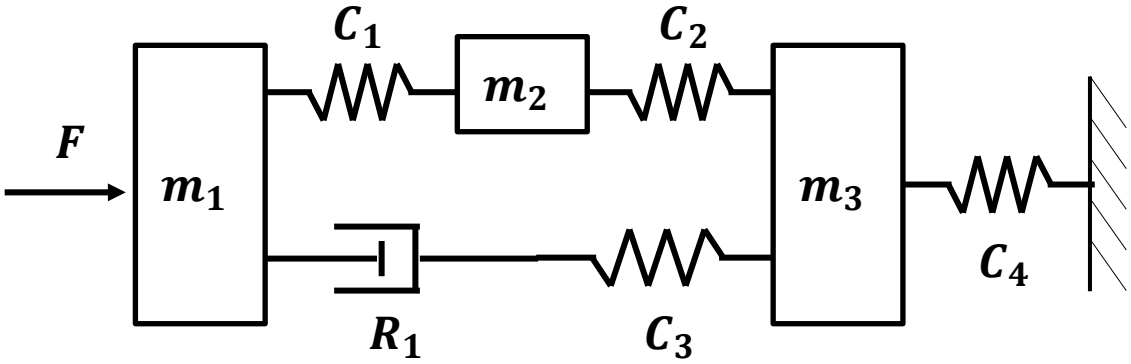
a.



b.

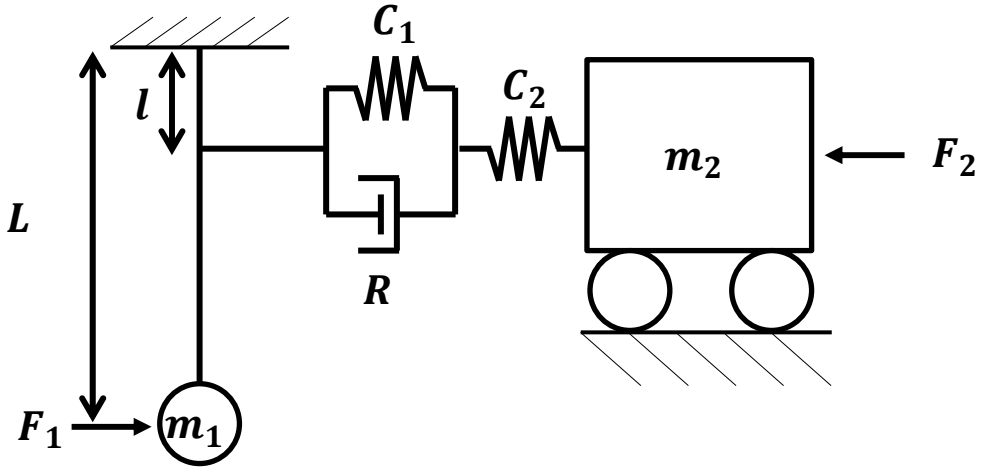


c.

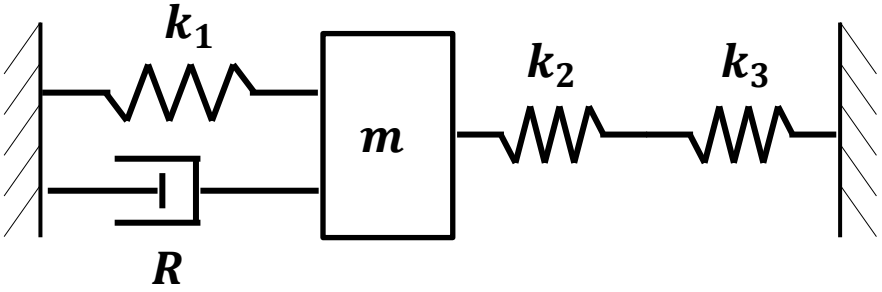


Homework Assignment:

2. For the system below, construct the equivalent circuit using transformers, and then as one circuit. Using loop analysis, determine the impedance matrix, **Z**, and verify your result with the LaGrange method.



3. Given m = 0.65 kg, R = 4.35 kg/s, k_1=1.2 N/m, k_2 = 4.0 N/m, and k_3=0.33 N/m, use an equivalent circuit model to find:
   a. The natural frequency of the system
   b. The damping ratio
   c. Is the response overdamped, underdamped, critically damped? Why?



Homework Assignment:

4. A massive damped pendulum is used to absorb vibration energy (swaying) in a tall skyscraper. The current design has a length of 12.6 m, mass of 6.6e5 kg, and a damping coefficient of 8.0e5 kg/s. Recent earthquake response measurements, combined with building dynamics simulations, suggest that the damped natural frequency of the pendulum be adjusted to 0.620 rad/s to improve the absorber's performance.
   a. Derive the equivalent circuit model of the system.
   b. Plot admittance as a function of frequency.
   c. It is not considered practical to change the pendulum length. What other method can you employ to achieve the new lower natural frequency? Propose modified design parameters to achieve this new goal.