

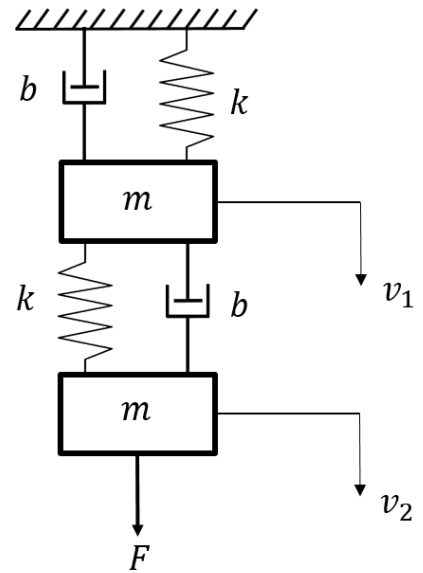
Homework 4

Question 1

For the system shown below,

- Draw the **Mechanical Circuit**
- Draw the **Impedance Circuit**
- Determine the **Mobility Equation**

Note: the impedance equation must be simplified



Question 2

A model for a single joint of a robotic manipulator is shown in Figure below. The usual notation is used. The gear inertia is neglected and the gear reduction ratio is taken as $1:r$ (Note: $r < 1$).

- Draw a linear graph for the model, assuming that no external (load) torque is present at the robot arm.
- Using the linear graph derive a state model for this system. The input is the motor magnetic torque T_m and the output is the angular speed ω_r of the robot arm. What is the order of the system?

