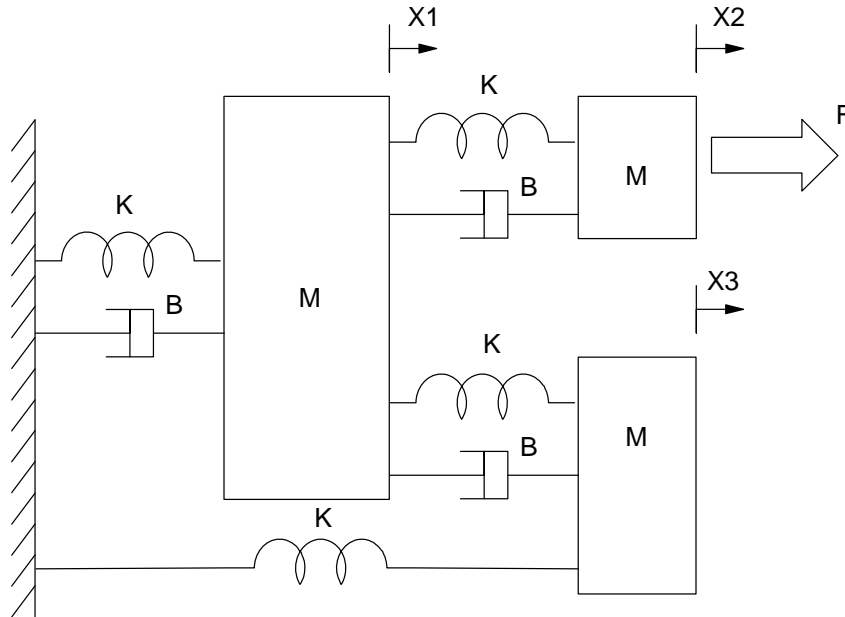


Homework #6: ECE 461

Mass Spring Systems, Rotational Systems, Error Constants. Due Monday, October 9th

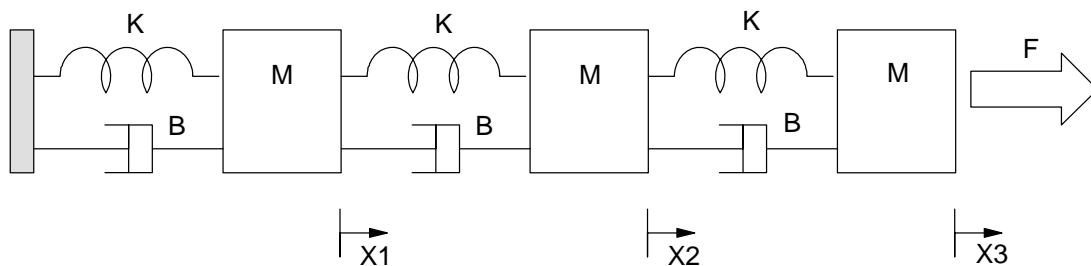
Mass Spring Systems

- 1) For the following mass-spring system
 - 1a) Draw the circuit equivalent
 - 1b) Place this system in state-space form
 - 1c) Find the transfer function from F to X_1
 - 1d) Find the step response from F to X_1



Problem 1: $M = 2\text{kg}$, $K = 5\text{ N/m}$, $B = 0.1\text{ Ns/m}$

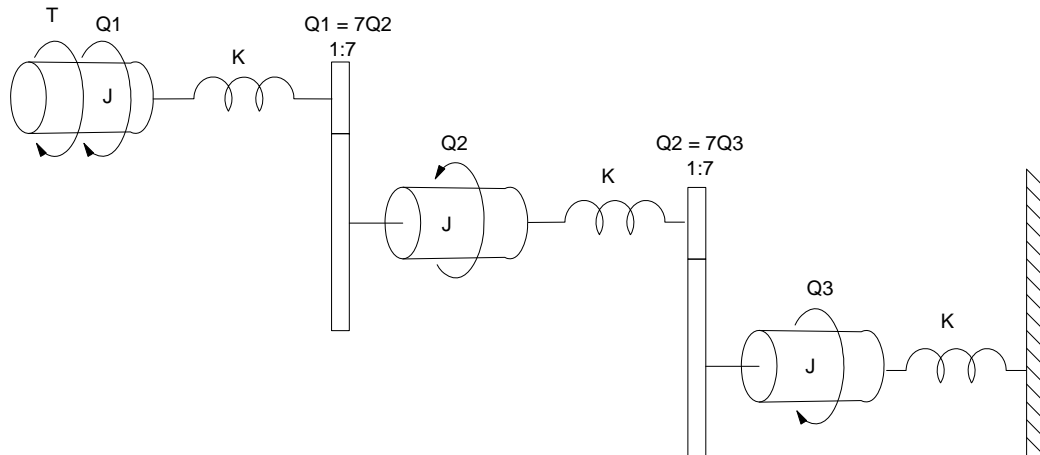
- 2) For the following mass-spring system
 - 2a) Draw the circuit equivalent
 - 2b) Place this system in state-space form
 - 2c) Find the transfer function from F to X_3
 - 2d) Find the step response from F to X_3



Problem 2: $M = 2\text{kg}$, $K = 5\text{ N/m}$, $B = 0.1\text{ Ns/m}$

Rotational Systems

- 3) For the following rotational system
- 3a) Draw the circuit equivalent
- 3b) Place this system in state-space form
- 3c) Find the transfer function from T to Q1
- 3d) Find the step response from T to Q1



Problem 3: $J = 2\text{kg m}^2$, $K = 5\text{ N/rad}$, $B = 0.1\text{ Ns/rad}$

DC Servo Motors

Find the transfer function for the DC servo motors used in the lab. Data on these motors are:

- $R_a = 24\text{ Ohms}$ (measured with an ohm-meter)
- $L_a = 12\text{ mH}$ (measured with an inductance meter)

When you apply +10VDC to the motor with no load

- It spins at 72 rad/sec
- It draws 130mA

The step response to a 10VDC step input is as follows (data on-line: 10ms/sample)

