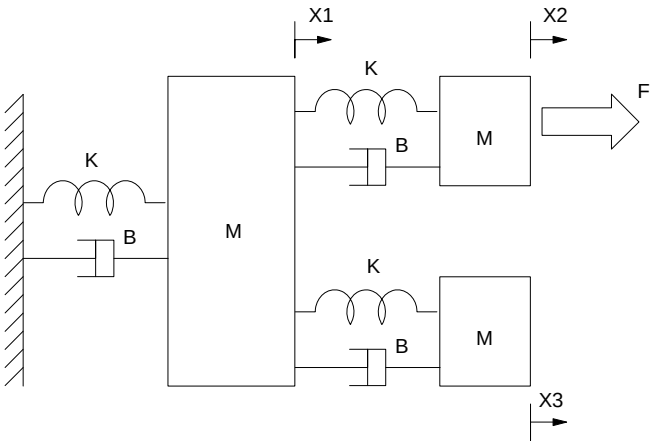
# ECE 461/661 - Homework Set #6

Mass-Spring Systems, Rotational Systems, DC Servo Motors - Due Monday, October 10th

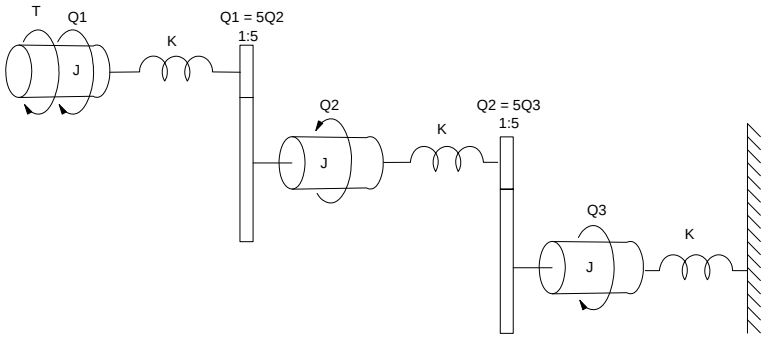
**Mass-Spring Systems.**




Problem 1-4: M = 1kg, K = 10 N/m, B = 0.1 Ns/m

1) Draw the circuit equivalent for the following mass-spring system
2) Write the dynamics for this system in state-space form
3) Find the transfer function from F to X1
4) Find the transfer function from F to X2

**Rotational Systems:**




Problem 5-7: J = 1 Kg $m^2$, K = 10 Nm/rad

5) Draw the circuit equivalent for the following rotational system
6) Write the dynamics for this system in state-space form
7) Find the transfer function from T to Q3

**DC Servo Motors**

ebay listing: Baldor MTB-3363-BLYCN servo motor servomotor w/brake
Date Sheets: http://www.baldor.com/mvc/DownloadCenter/Files/BR1202-F

8) Determine the transfer function and step response for the following DC servo motor:

Baldour MT-3363-B DC Servo Motor: (476W)

- Rotor Inertia: 3.67 kg cm2
- Viscous Damping: 7.8E-3 Nm/krpm
- Torque Constant: 0.297 Nm/A
- Resistance: 2.4 Ohms
- Inductance: 6.1mH
- Total Weight: 5kg (11 lb)
- Price: $625 on ebay

9) Determine the transfer function and step response for this DC servo motor if it is attached to a Battle Bot with the following specs

- Cart Mass: 10kg
- Wheel Mass: 0.2kg
- Wheel Diameter: 3cm