

The University of Texas at Austin
Mechanical Engineering Department
MODELING OF PHYSICAL SYSTEMS

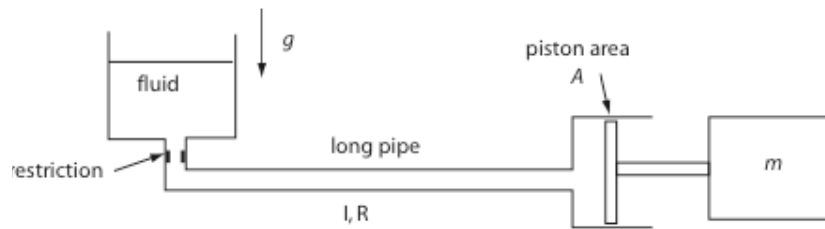
J.J. Beaman
Assigned 2/11/2022

ME 383Q.4
Assignment 2

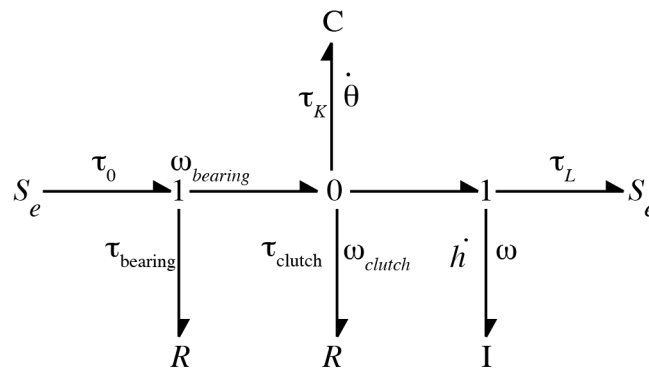
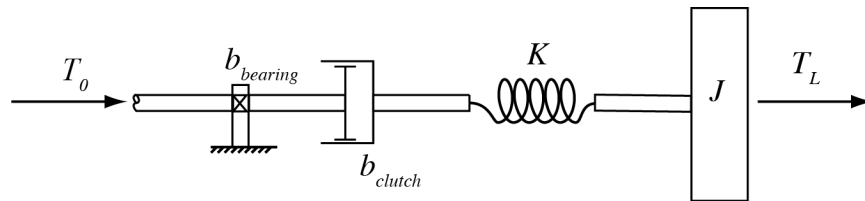
Spring 2022
Due 2/24/2022

Read Chapters 3

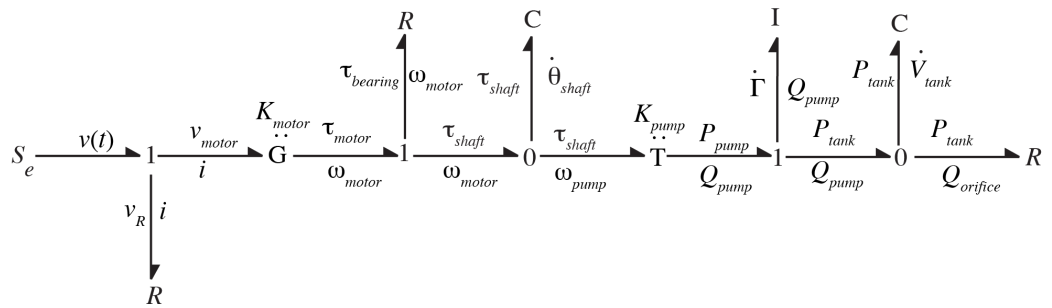
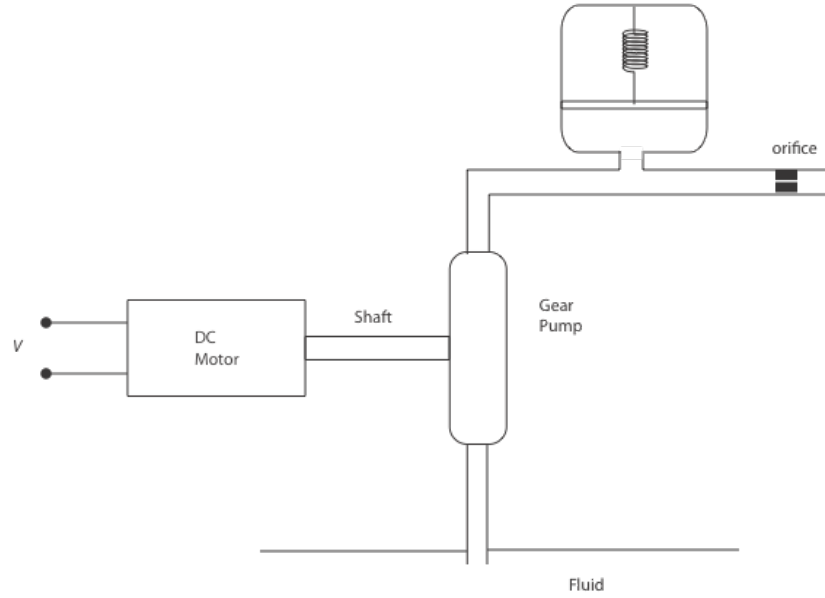
1. Obtain a bond graph model of the following schematic, apply causality, list the states, and write state equations.



2. Consider the rotational system and bond graph model shown below.



- a. Apply causality to the bond graph and list a set of state variables
 - b. Obtain a set of state equations.
3. Shown in the diagram is an electro-hydraulic drive system and a bond graph
 - a. Apply causality to the graph
 - b. Obtain state equations.



The constitutive relations for all the sources, energy storing, dissipating, and coupling elements you are to use are:

$$v(t)$$

$$v_R = Ri$$

$$\tau_{\text{motor}} = K_{\text{motor}}i$$

$$v_{\text{motor}} = K_{\text{motor}}\omega_{\text{motor}}$$

$$\tau_{\text{bearing}} = B_{\text{motor}}\omega_{\text{motor}}$$

$$\tau_{\text{shaft}} = K_{\text{shaft}}\theta_{\text{shaft}}$$

$$Q_{\text{pump}} = K_{\text{pump}}\omega_{\text{pump}}$$

$$\tau_{\text{pump}} = K_{\text{pump}}P_{\text{pump}}$$

$$Q_{\text{pump}} = \Gamma/I$$

$$P_{\text{orifice}} = R_{\text{orifice}}Q_{\text{orifice}}$$

$$P_{\text{tank}} = V_{\text{tank}}/C_{\text{tank}}$$