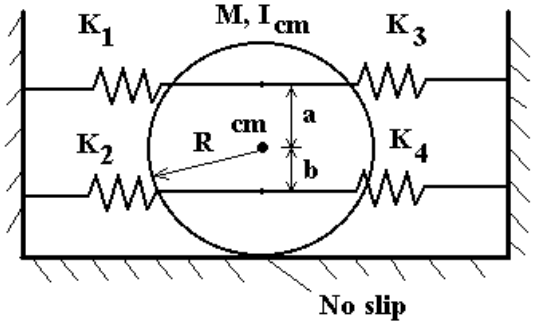
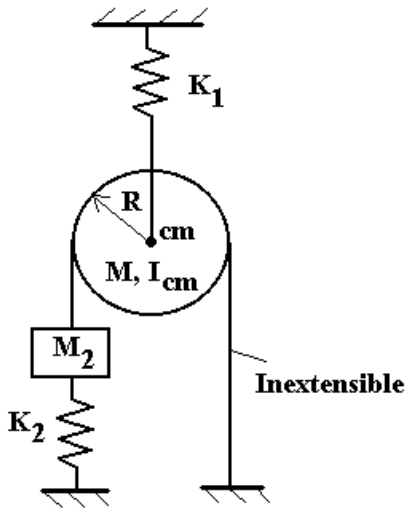
ME 563 **HOMEWORK # 1** **Fall 2010**

PROBLEM 1: (40%)

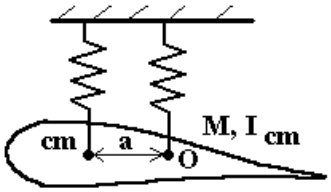
Derive the equations of motion for the three systems shown in the figure below using Newton-Euler techniques (A, B, and C) and energy/power methods (A and B only).



(A)



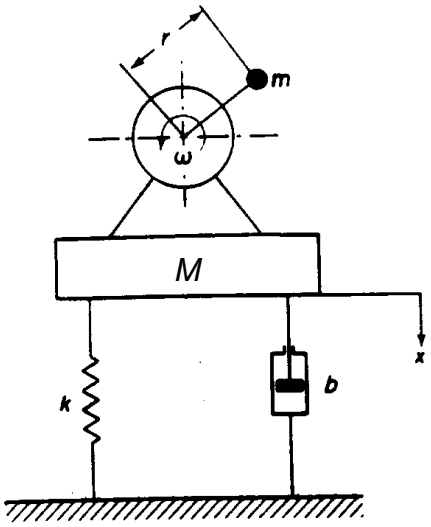
(B)



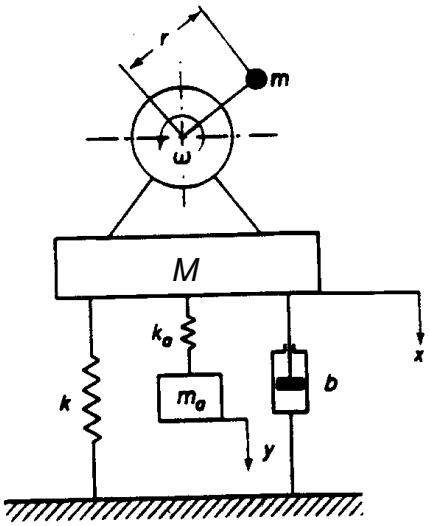
(C)

PROBLEM 2: (40%)

A grinder of mass, M, is mounted to a base whose rubber supports have stiffness k and viscous damping B. The unbalanced effect can be modeled as mass m with eccentricity r. The wheel speed is ω. Derive the equations of motion of the two systems shown below: (a) system without a dynamic absorber, and (b) system with a dynamic absorber of mass m_a and stiffness k_a. Use the coordinate directions shown. Ignore the effects due to gravity.



(A) Without absorber



(B) With absorber

PROBLEM 3 (20%)

The figure below illustrates the components in a traditional loud speaker. Model the speaker and derive its equation of motion. Include all components necessary to describe the important mechanical behavior of the speaker. Do NOT assume that the cone and diaphragm are axi-symmetric.