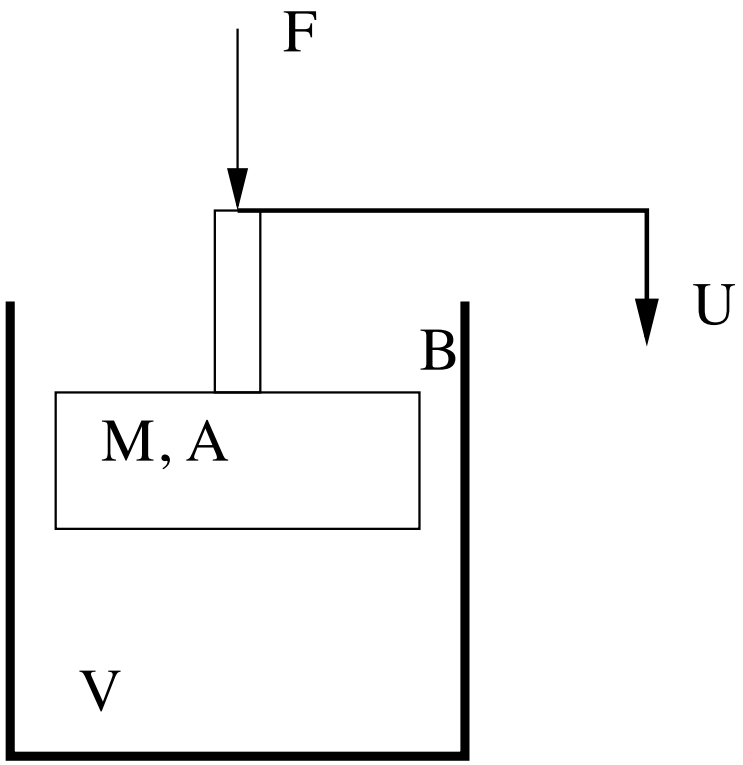
Department of Electrical and Computer Engineering
University of Massachusetts Lowell

EECE4130/16.413 Problem Set #2

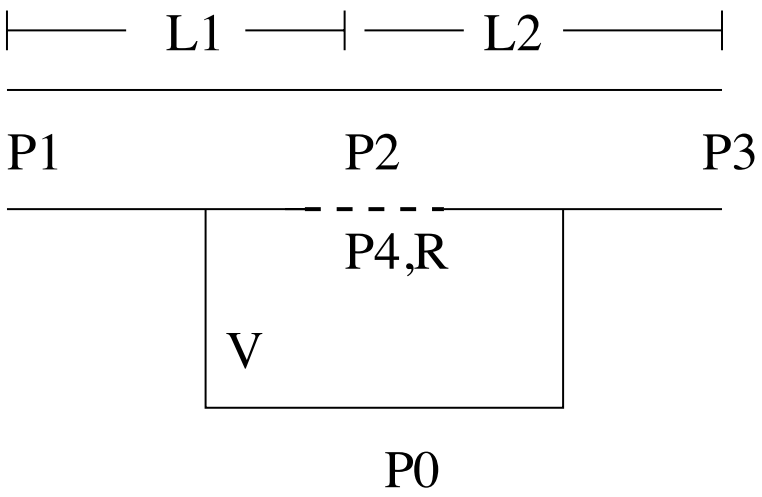
1.Consider the acousto-mechanical system. The velocity of the massive piston having cross-sectional area A is given by U and the applied force is given by the variable F. The motion of the piston compresses the fluid in cylinder. The fluid volume is taken to be equal to V. B the damping coefficient between the piston and the cylinder.



a. Determine the equations of motion in the Laplace-domain.

b. Determine the equations of motion in the time-domain.

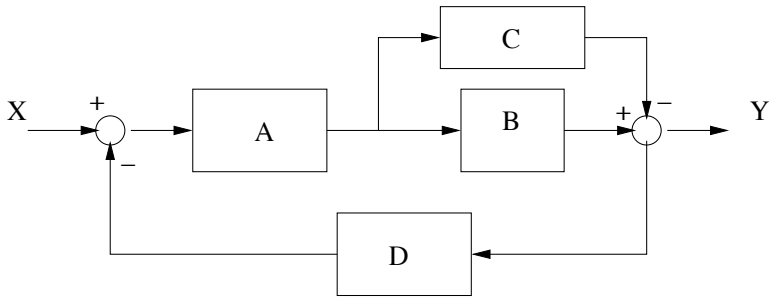
2.Consider the acoustical system where the cross sectional area of pipes are equal to *A*. The variable *R* is the acoustical impedance of the screen.



a. Using impedance analogy where the volume-velocity is the "through" variable and pressure is the across-variable, determine the an equivalent circuit analog of the system.

b. Determine the equations of motion in the Laplace-domain.

c. Determine the equations of motion in the time-domain.



3. Consider the system block diagram.
   a. Redraw the system as a signal flow graph
   b. Using Mason's gain formula find $Y(s)/X(s)$.