Department of Electrical and Computer Engineering
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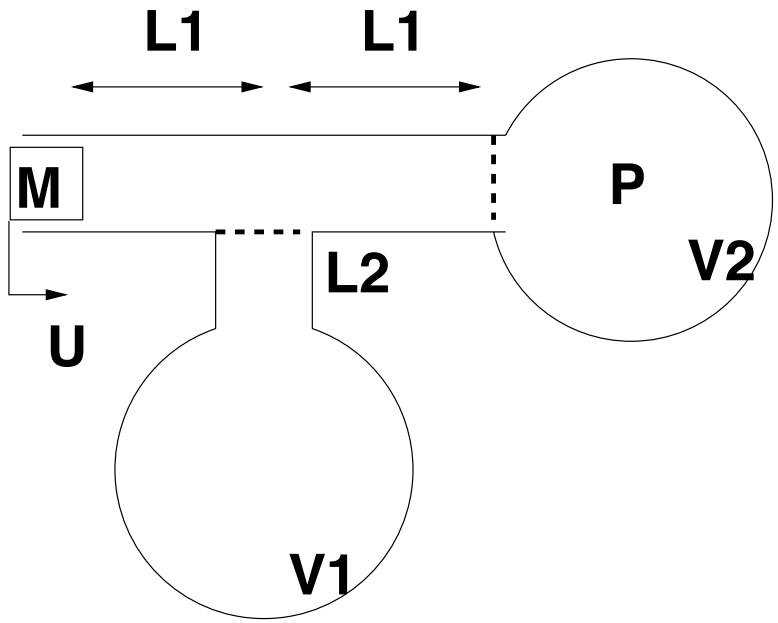
16.413 Problem Set #2

1.Consider the mechanical-acoustical system. The velocity of the mass are given by u. The crossectional area of each pipe is equal to A. The two screens have equal acoustic impedance R_A.

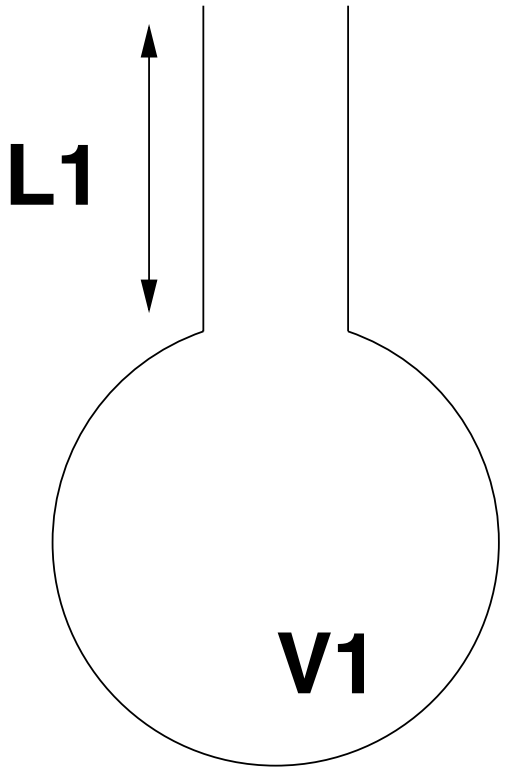


a. Using the pressure as the across variable and volume velocity as the through variable determine the an equivalent circuit for the system.

b. Determine the equation of motion in the Laplace domain.

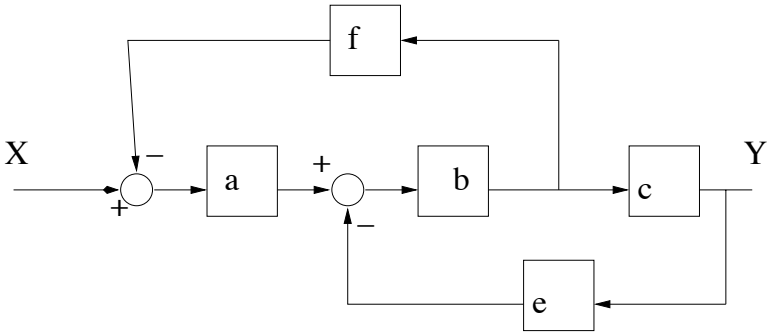
c. Find the pressure P given the velocity of the mass, U

2.Consider the empty wine bottle depicted in the figure. The cross sectional area of the neck is given by the variable A.



a. Using impedance analogy where the pressure is the "across" variable, determine the an equivalent circuit for the system.

b. If $L_1 = 7cm, V_1 = 354cm^3$ and the neck diameter is equal to $1.8cm$ determine the resonant frequency.



3. Given the block diagram find Y/X using Mason's gain formula.