Concordia University
Department of Computer Science and Software Engineering

SOEN 385-Control Systems and Applications

Assignment No. 2
Due date: Tuesday March 1, 2011

The textbook referred to in this assignment is: Control Systems Engineering, 5th Edition, by N. S. Nise, John Wiley & Sons.

1)

a) Write the state equations for the system described by the differential equation below. Then express these equations in matrix form.

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = 2u(t)$$

b) Draw a simulation diagram for the system in part (a).

c) Write the state equations for the system described by the differential equation:

$$\frac{dy(t)}{dt} + 3y(t) = 2u(t)$$

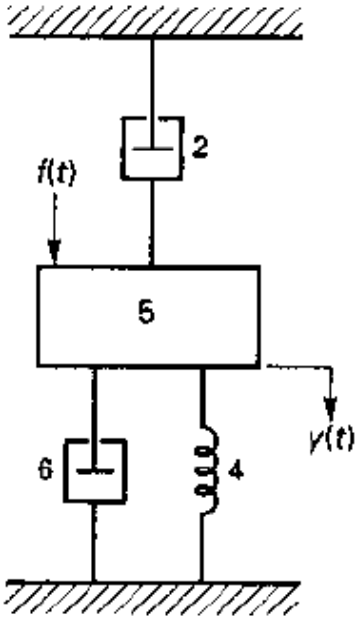
2) Consider the mechanical translational system shown in the following figure. All coefficients are in the same units (MKS).

a) Write the set of state equations for this system.

b) From these equations, construct a simulation diagram (signal flow graph) for the system.

c) Use Mason's rule and the simulation diagram of part (b), find the transfer function $Y(s)/F(s)$.

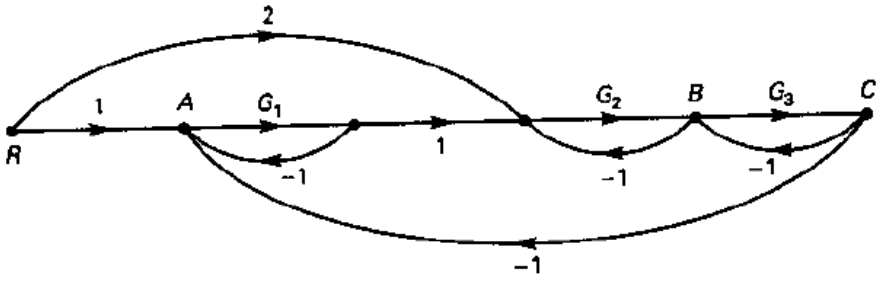
d) Verify the results of part (c) by using Matlab and the state equations in part (a).



3)

a) For the flow graph in the figure below, use Mason's rule to find the transfer function $C(s)/R(s)$.

b) Write three equations in the variables A, B, and C. Then verify the results in part (a) using Cramer's rule.



4) Do problem 13, page 145 in chapter 3 of the textbook.

5) Do problem 27, page 149 in chapter 3 of the textbook.