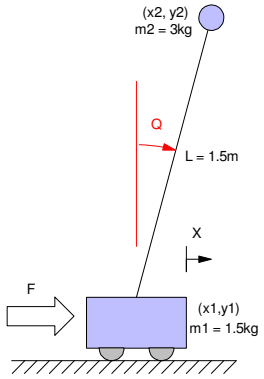
ECE 463/663 - Homework #13

VSS & Saturating Control. Due Monday, May 5th

VSS Control

1) For the cart and pendulum system of homework set #4:

$$s\begin{bmatrix} x \\ \theta \\ \dot{x} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & -19.6 & 0 & 0 \\ 0 & 19.6 & 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ \theta \\ \dot{x} \\ \dot{\theta} \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0.667 \\ -0.444 \end{bmatrix} F$$



Design a VSS control law so that the cart and pendulum system behaves like the following reference model:

$$y_m = \left(\frac{4}{(s+2)\left(s^2+s+2\right)}\right) R$$

2) Find the step response of your control law on the linear model

- Plot the output (x) vs time
- Plot the input (F) vs time

3) Find the step respone of your control law on the nonlinear simulation

Saturating Control:

4) Design a saturating control law so that the cart and pendulum system behaves like the following reference model:

$$y_m = \left(\frac{4}{(s+2)\left(s^2+s+2\right)}\right) R$$

5) Find the step response of your control law on the linear model

- Plot the output (x) vs time
- Plot the input (F) vs time

6) Find the step respone of your control law on the nonlinear simulation