ASEN 5022, Spring 2005. Homework 1 (Due: Tuesday, 25 January 2005)

Computations of Step Input Response and Frequency Response Functions(FRF) for 2-DOF Models

Starting with the MATLAB code provided in the lecture notes and slides, extend the 1-DOF code to 2-DOF model problems discussed during January 13 and 18. In doing so, choose your own model parameters, M_1, m_2, K_1, k_2, etc., with restriction $K_1/M_1 \neq k_2/m_2$.

(1) Express equation(1) in the January 13 lecture notes in terms of the canonical form (or state space form), e.g., determine [a], [b], [c], [d].

(2) with $f_2 = 0$ and a step load applied to mass M_1, obtain the step response and plot your response results of x_1 and x_2.

(3) Vary the damping c_2 and plot, $x_1(\omega)/x_{st}(\omega)$, vs. the frequency ω by utilising (not the hard-wired code contained in the lecture note!) *'ss'*, *'tf'* and *'freqresp'* matlab functions as used in the 1-DOF example. This is called a FRF for the output x_1

(4) Now choose the mass ratio $\mu = m_2/M_1 = 0.25$ and $(k_2/m_2)/(K_1/M_1) = 1/(1+\mu)$. Plot the frequency fresponse function of $x_1(\omega)/x_{st}(\omega)$.

(5) Repeat Problem (2) for the model parameters given in Problem (4).

(6) Summarize your findings (what have you learned from this homework?)