**Homework #8 (ASEN5022, Spring 2005)**

*Due at Start of Class on Thursday, 26 April 2005*

8.1 **Analysis and Design of an Shoick Absorber by Two-DOF Model**

Consider the system illustrated in Fig. 22.6 and perform the following.

8.1.1 Obtain the governing equations of motion for the proposed model.

8.1.2 Obtain the frequency response function, $X_1/x_g$.

8.1.3 Carry out non-dimensionalization of the frequency response or transfer function.

8.1.4 Initially by setting $K_1/M_1 = K_2/M_2$, plot the FRF vs the driving frequency ($\omega$), which is a road profile in this instance by varying the system damping. Does thos model exhibit invariant points? If so, describe how you may utilize them for a good suspension system.

8.1.5 Carry out, either analytically or relying on simulations, an optimum set of model paramters in terms of mass ratio ($\mu$) and damping ratio $\zeta$.

## 8.2 **Analysis and Design of a Resonator**

8.2.1 Carry out the double-beam resonator performance by varying the offset, $1/16 \leq e \leq 1/2$, hence varying the offset factor $a$. Which offset gives a minimum frequency separation between the first peak and the second?

8.2.2 Now vary the dimensions of the link beam, $(L_s, b_s)$ to see if the resulting FRF can be improved. Keep in mind this will change $k_s$ and $m_s$, hence changing $M_1 = M_2$ as well as $K_{12}$. What is your finding?

8.2.3 Now, imagine that one could come up with a resonator that can be modeled as the system shown in Fig. 22.1. Would you be able to use the model and analysis procedures discussed in Lecture 22 to *maximize* the peak response at the invariant points? Show your answer by your analysis.

8.2.4 Repeat Problem 8.2.3 by employing the model shown in Fig. 22.6 where $x_g$ now acts as the substrate wave motion.