Name _____

EM406
Examination II
October 12, 2004

Problem	Score
1	/40
2	/40
3	/20
Total	/100

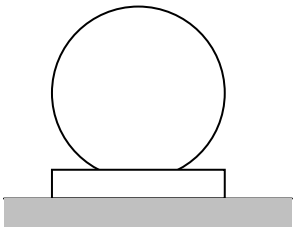
Show all work for credit
AND
Turn in your signed help sheet
AND
Stay in your seat until the end of class

Name _____ 40 pts

EM406 Examination II **Problem 1** October 12, 2004

A 35 kg motor is found to have an unbalance of 0.5 kg-m and has an operating speed of 1200 rpm (125.66 rad/s). The motor has bolt holes at each of the four corners of the base.

a) If the motor is bolted directly to the ground determine the vertical force transmitted to the ground.
b) Neglecting damping, design an isolator to obtain an 80% reduction in the force transmitted to the ground. What is the force transmitted?
c) Since every real system has damping would you expect the actual force transmitted to be larger or small than the value calculated in part b)? Explain.



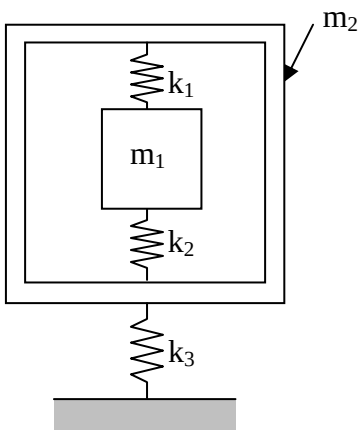
Name _____ 40 pts

EM406 Examination II **Problem 2** October 12, 2004

For the system show

a) Find the equations of motion and put in second order matrix form.

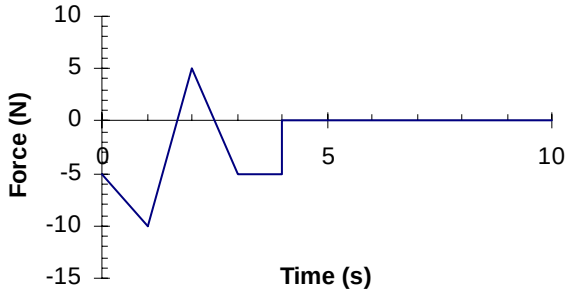
b) For $k_1 = k$, $k_2 = 2k$, $k_3 = 3k$, $m_1 = m$, and $m_2 = 2m$ determine the natural frequencies and modes. You may use Maple or Matlab, but be sure to include enough work below so I know what you did.

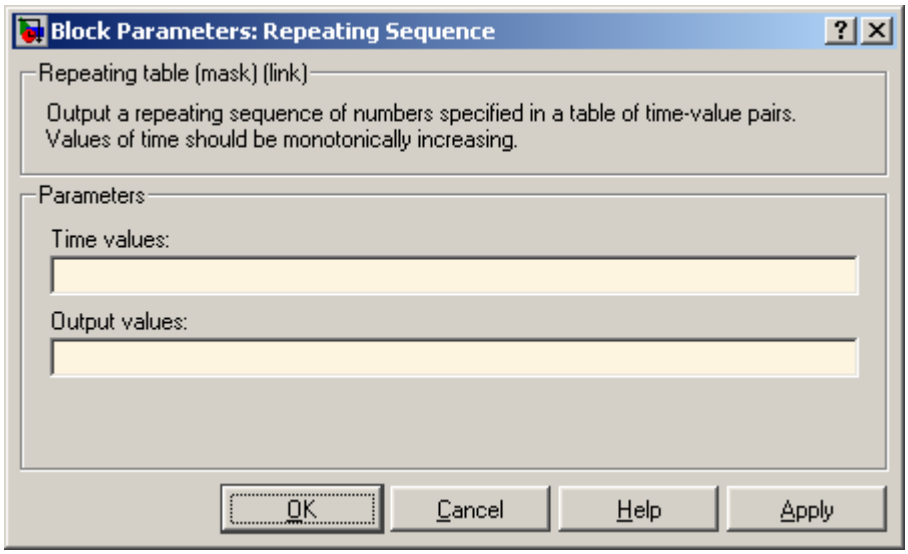


Name _____ 20 pts

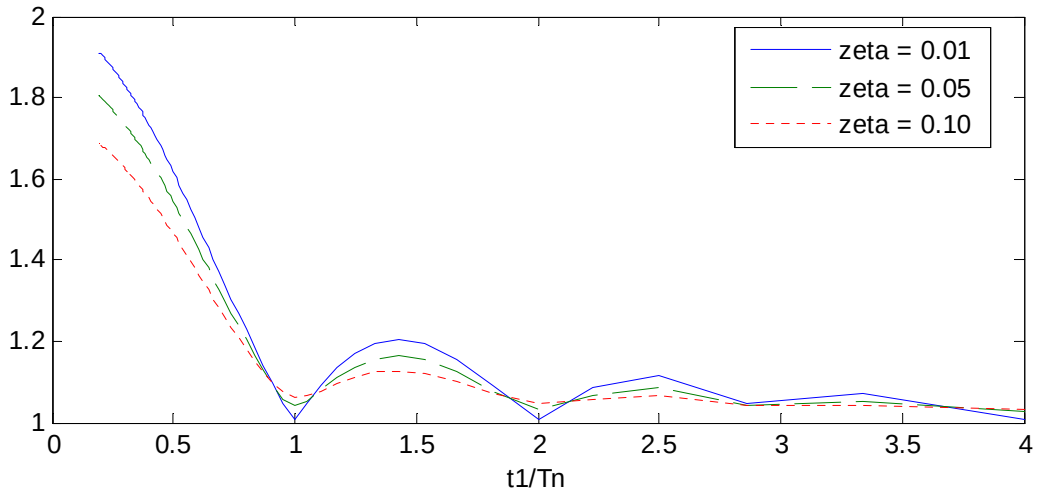
EM406 Examination II **Problem 3** October 12, 2004

3.1) (3 pts) A second order system is forced with the excitation shown below. After t = 4 the force is zero. The simulation is to be run for 10 seconds. Fill in the repeating sequence block for this input.

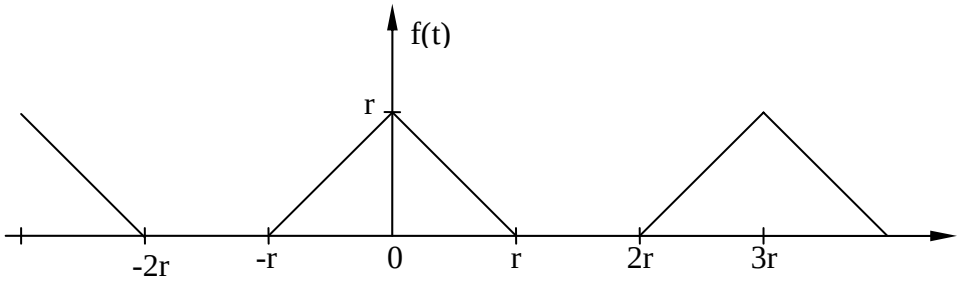




3.2) (3 pts) A displacement response spectrum is shown below where Tn is the natural period. Label the vertical axis.



3.3) (3 pts) Determine the constant term a_0, in the Fourier series of the following function.
Hint: You don't need an equation for the lines. Show work for partial credit.



3.4) (3 pts) The Fourier series would consist of:

a) sine and cosine terms plus a constant
b) sine terms only
c) cosine terms plus a constant
d) sine terms plus a constant
e) none of the above

3.5) (3 pts) List three ways to mount an accelerometer.

3.6) (5 pts) A system is found to have the equations of motion,

$$\ddot{y}_1 + C_1 y_1 - y_2 = 0$$
$$\ddot{y}_2 + C_2 y_2 - y_1 = 0$$

Knowing the first natural frequency is 2 rad/s and the first natural mode is $\{2\ 1\}^T$. Determine the values of C_1 and C_2.