PROBLEM SET #12 FOR 13.013

DUE NOVEMBER 28, 2001

- 1. The TLP in surge has an equation of motion and natural frequency as found in P.S. 11,
 - a. How much horizontal force is required to cause a static surge displacement of 1 foot?
 - b. Assume you have a horizontal wind force ten times the amount found in a. It acts at the natural period in surge. Also assume you have a surge damping ratio of 5% of critical. What is the surge response amplitude and phase angle with respect to the wind force?
- 2. In the problem 6-110 from the last homework, you know the EOM and the natural frequency. Connect a linear damper to the piece that moves back and forth.
 - a. What is the dash pot constant *R* which will give a damping ratio of 10%? Express algebraically.
 - b. Let m = M = 1kg K = 100N/m a = .05mL = 0.5m

Give numerical values for ω_n and R from part a.

c. Let $\frac{F_o}{K} = .01m$. If F(t) is an harmonic excitation, compute the response

amplitude and phase angle when $\frac{\omega}{\omega_n} = 0.5$, 1.0, and 3.0

- 3. Power is force times velocity. Compute the average power dissipated in the dash pot in part 2c.
- 4. Express the complex number.

$$(4+2.5i)$$
 in $Ae^{i\theta}$ and $Be^{-i\theta}$ form

$$\frac{1}{1+4i}$$
 in $Be^{-i\theta}$ form

6. Let $x(t) = (3+4i)e^{i\omega t}$. Express the real part as $A\cos(\omega t - \theta)$.