CE 487 **HOMEWORK – 4** **15/12/2006**

Due Final Exam

Consider the frame given in Problem 2 of Homework 3.

1.) Calculate the first eigenvalue and eigenvector (mass-normalized) by using the inverse iteration method.

2.) Calculate the second and the third eigenvalue and eigenvector (mass-normalized) by using inverse iteration with shifts.

3.) Calculate the damping matrix (Rayleigh) by assuming ζ=0.05 for the first and the third modes.

4.) A force vector $\underline{p}(t) = p_0 \cos\omega t \begin{bmatrix}0 & 0 & 1 & 0 & 0\end{bmatrix}^T$ acts, where p_0 = 250 kN and $\omega = 2\omega_1$.

a) Determine the modal displacement vectors $\underline{u}_1$, $\underline{u}_2$, $\underline{u}_3$ and the total displacement vector $\underline{u}$ (consider only first three modes) at $t = T_1/2$.

b) Determine the modal force vectors $\underline{f}_1$, $\underline{f}_2$, $\underline{f}_3$ and the story shear distribution (consider only first three modes) at $t = T_1/2$.

c) Determine the base shear time history V_b (t) by using the first three modes, for $t \leq 4T_1$ and compare with the external dynamic force.

Present your results graphically.

Use Matlab or Mathcad in your calculations, and show your steps explicitly.