Name: _____

University of California at Berkeley
Civil and Environmental Engineering

Instructor: Stephen Mahin
Spring Semester 2007

CE 227 -- Earthquake Resistant Design

Midterm 2 (Take Home)

This examination is open book and notes. Unless specified otherwise, you may assume firm soil conditions, 5% viscous damping, and ideal elasto-perfectly plastic hysteretic behavior. Newmark and Hall procedures for constructing and interpreting response spectra may generally be used. You may make other assumptions as appropriate, but be sure to identify them.

Please cite all specific sources of information and equations that you use in solving these problems.

You may discuss the exam problems with classmates BEFORE you start the exam. The submitted exam solutions must represent your own independent work.

Please turn in your completed exam to me or slip it under the door to my office (777 Davis Hall) by 5 PM on Tuesday, May 1, 2007.

There will be no class on May 1.

Good Luck

Name: _____

1. _____ (15)

2. _____ (25)

3. _____ (35)

4. _____ (25)

Total _____ (100)

Problem 1

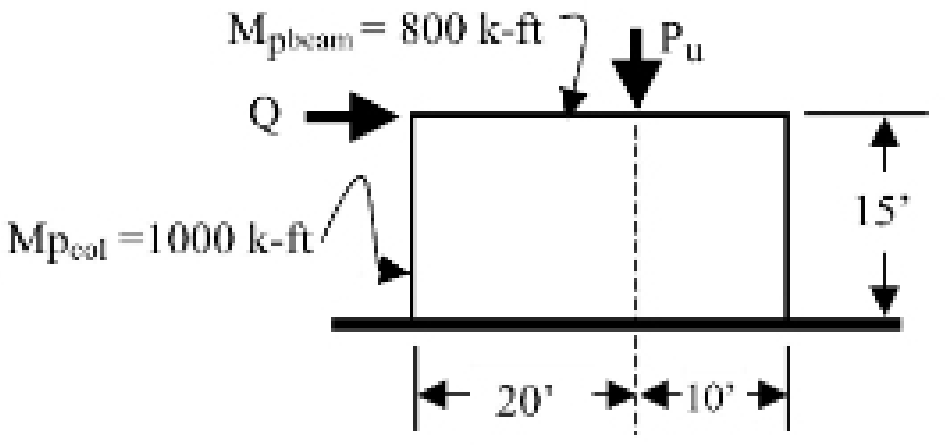
Consider the structure shown below. The lateral load Q is increased until the structure collapses. Only a single constant vertical gravity load is applied; this is based on service level dead and live loads of P_D = 40 kips and P_L = 20 kips. The two columns are identical and both are fixed at the base.

You should neither determine Q, nor draw the complete moment, shear or axial force diagrams for the structure. You only need provide the specific answers requested! Thus, use as simple of an approach as possible.

i. Do plastic hinges form in the structure away from the ends of the members for the loading conditions shown? Show simple calculations to justify your answer.

ii. If a complete collapse mechanism forms in the structure, would you expect the column to see net tension force? If so, what is the peak value expected for this tensile force? If not, briefly say why?

iii. What is the maximum shear force in the beam that must be considered in design so the structure would be expected to form a complete inelastic collapse mechanism before shear yielding of the beams?



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Problem 1 (extra page for calculation)