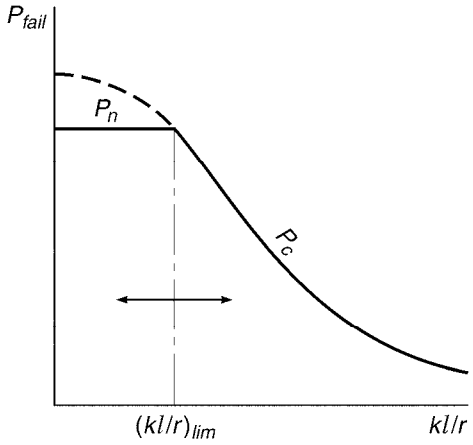
447.328 Theory of Reinforced Concrete and Lab. II
Fall 2007

Midterm Exam #2 **November 19, 2007**
(Closed Textbook & Note) **Instructor: JAE-YEOL CHO**

Problem 1. (**15 pts.**) Explain the *Reciprocal Load Method* with figures and the reason why we adopt the approximated Bresler's reciprocal load equation in KCI Code.

$$\frac{1}{P_n} \approx \frac{1}{P_{nx0}} + \frac{1}{P_{ny0}} - \frac{1}{P_0}$$

Problem 2. (**10 pts.**) Following figure shows the effect of slenderness on strength of axially loaded columns. Explain the limiting slenderness ratio and the reason why P_n is considered to be lower than actual P_{fail}-*(kl/r)* relationship.



Problem 3. (**10 pts.**) Slender columns are classified into compression members in *Sway* and *Nonsway* frame. Explain which system is preferable with moment diagrams.

Problem 4. (**10 pts.**) You have already experienced a design of a slender column in a nonsway frame in class. Followings are essential procedure items for design of a slender column but unfortunately those are mixed up by mistake. Could you put them in correct order?

① Calculate moment magnification factor δ_{ns} and magnified moment M_c

② Calculate β_d, EI, and P_{cr} for the trial column.

③ Recheck against the slenderness criteria.

④ Determine whether the frame should be considered as sway or nonsway.

⑤ Calculate the equivalent uniform moment factor C_m.

⑥ Find the unsupported length l_u.

⑦ Determine whether the slenderness effect should be considered with k=1.

⑧ Select a trial column section for P_u and M_u=M_2 from the elastic first-order analysis.

⑨ Check the adequacy of the column to resist axial load and magnified moment, using the column design chart.

⑩ If moments from the frame analysis are small, check to determine if minimum moment controls.

⑪ If slenderness is to be considered, refine k based on the alignment chart with member stiffness EI/l and rotation restrain factors ψ based on the member size.

Problem 5. (**10 pts.**) Explain the difference between sway frame and nonsway frame in the application of moment magnifier method.

Problem 6. (**15 pts.**) Discuss the difference of behaviors of two-way edge supported slabs and column supported slab.

Problem 7. (**30 pts.**) Consider a 1.8m×1.2m rectangular concrete footing. Vertical compression load P = 890 kN is being applied at a distance of e = 150 mm along the x-axis. (1) Calculate the bearing pressure (soil pressure) acting on the bottom of footing. (2) Calculate the bearing pressure again for the increased eccentricity e = 375 mm (3) discuss the results of (1) & (2)