CEE 379 **Problem Set 4** **Autumn 2007**

(Due in-class, Oct. 19th)

You can work in groups of 2-4 to complete this assignment. Turn in only one assignment per group. Write the names of all members of the group on this sheet.

Names: 1. _____

2. _____

3. _____

4. _____

In all problems, consider a truss member a cross-sectional area, A = 10.0 in^2, a modulus of elasticity, E=29 x 10^3 ksi, and a yield stress of 50 ksi (with no strain hardening). The nodal coordinates of the member are as follows:

X_N = 10 in. Y_N = 0. in.
X_F = 10 in. Y_F = 150 in.

Problem 1. Compute the element stiffness matrix for this member.

L = _____

AE/L = _____

cos θx = _____

sin θx = cos θy _____

k (4x4 matrix) =

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Problem 2. Consider the following set of end displacements.

D_{NX} = 0 in. D_{NY} = 0 in.
D_{FX} = 1.5 in. D_{FY} = 0 in.

a) Calculate the element nodal forces and axial force using the element stiffness matrix computed in Problem 1.

b) Considering the actual deformed geometry , the actual change in length and the actual stress-strain relationship, calculate the element nodal forces and axial force for the same set of joint displacements.

ΔL =

ε =

σ =

P =

new θ =

Q_{Nx} =

Q_{Ny} =

Q_{Fx} =

Q_{Fy} =

c) Compare the results of your calculations for parts a and b. How are they the same or different?

Problem 3. Consider the following set of end displacements.

D_{NX} = 0 in. D_{NY} = 0 in.
D_{FX} = 0 in. D_{FY} = 1.5 in.

a) Calculate the element nodal forces and axial force using the element stiffness matrix computed in Problem 1.

b) Considering the actual deformed geometry , the actual change in length and the actual stress-strain relationship, calculate the element nodal forces and axial force for the same set of joint displacements.

ΔL =

ε =

σ =

P =

new θ =

Q_{Nx} =

Q_{Ny} =

Q_{Fx} =

Q_{Fy} =

c) Compare the results of your calculations for parts a and b. How are they the same or different?