

**2.094**  
**FINITE ELEMENT ANALYSIS OF SOLIDS AND FLUIDS**  
**SPRING 2008**

**Homework 6**

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Assigned: 03/13/2008  
Due: 03/20/2008

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**Problem 1 (20 points):**

Consider Example 6.3 in the textbook, pages 494, 495.

Assume that the equilibrium has been established for  $\frac{{}^tR}{2kL} = 2 \times 10^{-3}$  where  $\frac{{}^t\Delta}{L} = 3.70223 \times 10^{-2}$ . Next, the equilibrium for  $\frac{{}^{t+\Delta t}R}{2kL} = 3 \times 10^{-3}$  shall be established. Perform the full Newton-Raphson iteration in Eqs. (6.11) and (6.12) to calculate  $\frac{{}^{t+\Delta t}\Delta}{L}$ . Use as the convergence criterion  $\frac{1}{2kL} \left( {}^{t+\Delta t}R - {}^{t+\Delta t}F^{(i-1)} \right) = 1.0 \times 10^{-6}$ .

Calculate the tangent stiffness matrices using the finite difference scheme given in class; you need to select an “appropriate  $\varepsilon$ ”.

Give a table listing the values calculated in each iteration.

**Problem 2 (10 points):**

Exercise 6.1 in the textbook, page 529.