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2.094 Finite Element Analysis of Solids and Fluids
Spring 2008

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2.094
FINITE ELEMENT ANALYSIS OF SOLIDS AND FLUIDS
SPRING 2008

Homework 6

Instructor: Prof. K. J. Bathe

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

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 ε ”.

Give a table listing the values calculated in each iteration.

Problem 2 (10 points):

Exercise 6.1 in the textbook, page 529.