# 2.092/2.093

## COMPUTER METHODS IN DYNAMICS

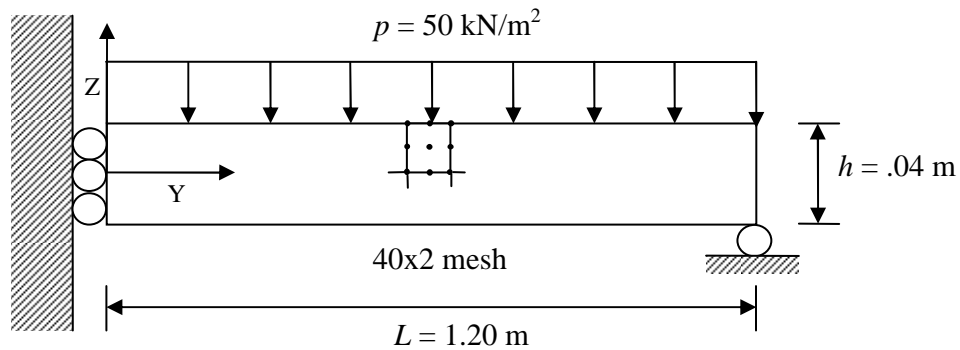### FALL 2006

## Homework 5

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| Instructor: | Prof. K. J. Bathe | Assigned: | Thurs., Oct 12 |
| TA: | Samar Malek | Due: | Thurs., Oct 19 |

**Problem 1** (20 points):

Consider the finite element model shown below. (The plane stress model is emailed to you).



$$E = 2\text{e}11 \text{ N/m}^2 \quad \nu = 0.3$$

thickness for plane stress problem $= 0.01$ m

a) Solve the model using ADINA assuming a **plane stress** problem. Plot the deformed geometry and make bandplots of all nonzero stresses. State the physical problem you thus have solved.

b) Solve the model using ADINA assuming a **plane strain** problem. Plot the deformed geometry and make bandplots of all nonzero stresses. State the physical problem you thus have solved.

c) Solve the model using ADINA assuming an **axisymmetric** problem. Plot the deformed geometry and make bandplots of all nonzero stresses. State the physical problem you thus have solved.

d) In each case, show that your results make physical sense.

**Problem 2** (10 points):

Consider Example 4.12, textbook page 188.

Calculate the nodal point forces $\underline{F}^{(m)}$, m=1,2, and show explicitly that

$$\sum_{m=1}^{2} F^{(m)} = \underline{R}$$

for each of the three nodes.