2.092/2.093

COMPUTER METHODS IN DYNAMICS

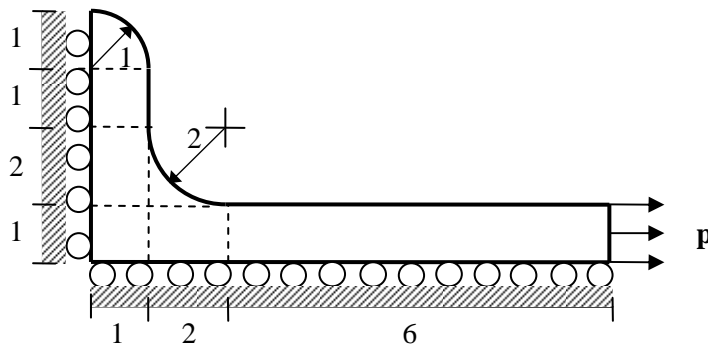### FALL 2006

Homework 7

Instructor:	Prof. K. J. Bathe	Assigned:	Thurs., Nov 2
TA:	Samar Malek	Due:	Thurs., Nov 9

Problem 1 (10 points):
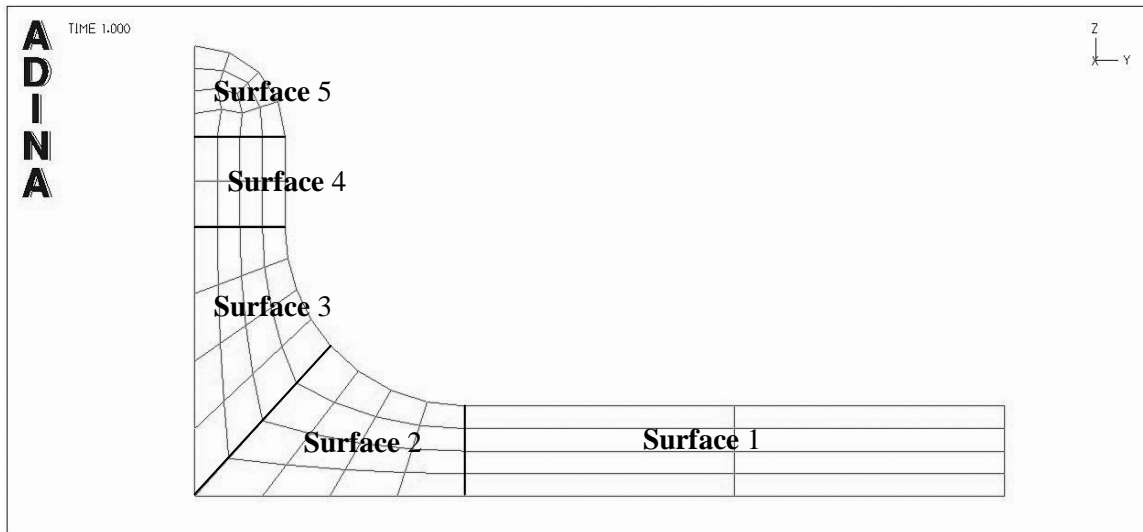
Consider the structure below.

Plane strain, thickness = 1 m

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

$\nu = 0$

All dimensions given above are in meters

Two mesh studies were performed using 4-node and 9-node elements. The initial mesh used in each case is shown below.

The 4-node and 9-node element meshes were refined two times where in each refinement each element was subdivided into 2x2 elements. Table 1 lists the mesh densities for the surfaces and Table 2 lists the strain energies calculated for the meshes. The tables also give the data for the reference meshes.

Table 1

	Mesh Density			
	Mesh			
Surface	I	II	III	Reference
1	2x4	4x8	8x16	32x64
2	4x4	8x8	16x16	64x64
3	4x4	8x8	16x16	64x64
4	4x2	8x4	16x8	64x32
5	4x4	8x8	16x16	64x64

Table 2

	Strain Energy	
Mesh	4-Node	9-Node
I	4.67267E-02	4.69724E-02
II	4.69102E-02	4.69788E-02
III	4.69616E-02	4.69802E-02
Reference	4.69792E-02	4.69804E-02

Plot $\log(E_{ref}-E_h)$ vs $\log(h)$ for both the 4-node and 9-node element meshes. Discuss your results.

Problem 2 (10 points):

Exercise 8.3, textbook p. 742.

Problem 3 (10 points):

Exercise 8.4, textbook p. 742.