

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Department of Mechanical Engineering  
2.001 Mechanics and Materials I  
Fall 2006

Problem Set 6

**Distributed:** Monday, October 23, 2006

**Due:** Wednesday, November 1, 2006

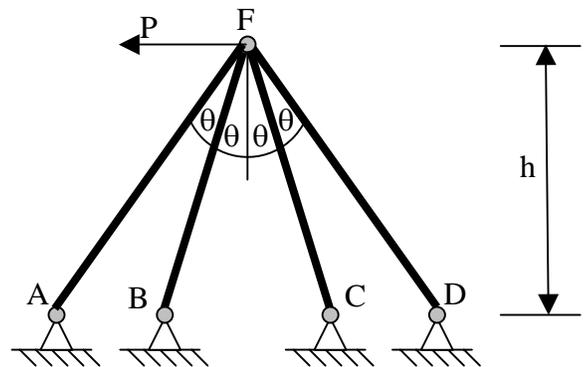
**Problem 1:** Hibbeler 4-68 and 4-69 (10 points). Note that ksi stands for “kilopound per square inch”.

**Problem 2:** Hibbeler 1-42 (10 points).

**Problem 3:** Hibbeler 1-64 (10 points).

**Problem 4:** Hibbeler 2-4 (5 points).

**Problem 5:** (10 points) A structure is composed of four bars pinned together as shown in the diagram to the right. Each bar has a cross-sectional area of  $A$  and a Young’s modulus of  $E$ . Before it is loaded, the bars fit together without interference (neatly, with nothing having to be forced into place). What are the forces in the bars and what is the displacement of point  $F$  when the load  $P$  is applied as shown?



**Problem 6:** (15 points) A 45 degree truss is built from bars pinned at  $A$ ,  $B$ ,  $C$ , and  $D$  (no pin where the bars cross). Each bar has a cross-sectional area of  $A$  and a Young’s modulus of  $E$ . Before it is loaded, the bars fit together without interference (neatly, with nothing having to be forced into place). The truss is then loaded as shown in the diagram at right. What are the forces in the bars when the load  $W$  is applied as shown? What are the displacements of points  $B$  and  $D$  when the load  $W$  is applied as shown?

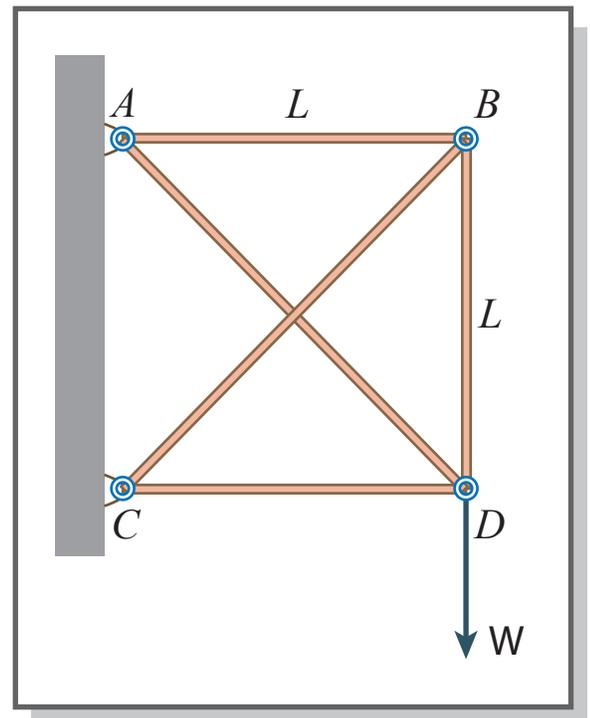


Figure by MIT OCW.

**Problem 7:** (15 points) The rigid bar AC is pinned to the wall at point A and is also pinned to the deformable bars shown below. The deformable bars each have a cross sectional area of  $A$  and a Young's modulus of  $E$ . Before the structure is loaded, the parts fit together without interference (neatly, with nothing having to be forced into place). What is the displacement of point B when the load is applied? What is the force in bar CE when the load is applied?

