6.2 Method of sections

Preparatory Problems

6.2.1 What is the method of sections?

6.2.2 When is the method of sections most useful?

6.2.3 With the free-body diagram associated with one section cut how many bar tensions can you hope to find?

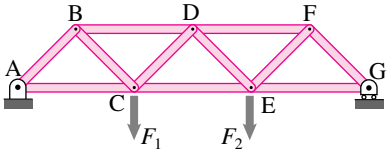
6.2.4 Given a truss and a particular bar in that truss

a) Can you always find one section cut with which you can find the desired bar tension?

b) If so, how do you find that cut? If not, why not?

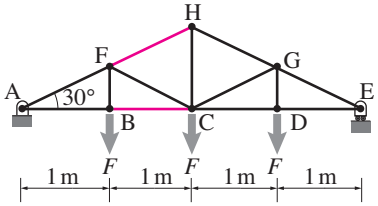
c) Whichever your answer above, give an example of a bar in a truss that illustrates your point.

6.2.5 This problem is exactly the same as Sample 6.3 where it was solved using method of joints. The truss is made up of five horizontal and six inclined rods. All inclined rods are 1 m long and at right angles to each other. The truss carries two vertical loads, $F_1 = 4$ kN and $F_2 = 1$ kN as shown. Find the tensions in rods CE, DE, and DF.



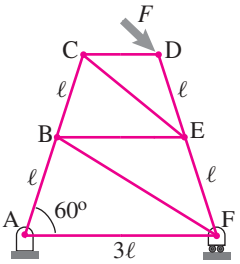
Problem 6.2.5

6.2.6 For the truss shown in the figure, find the tensions in rods BC and FH, assuming $F = 10$ kN.



Problem 6.2.6

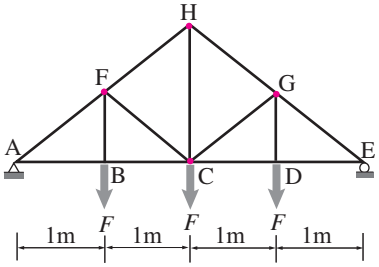
6.2.7 A force $F = 3$ kN acts at 45° with the horizontal at joint D of the truss shown in the figure. Find the tension in rod BE.



Problem 6.2.7

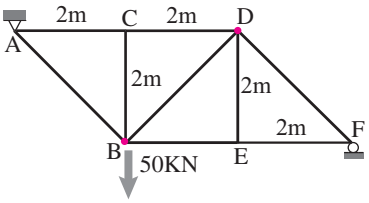
More-Involved Problems

6.2.8 For the 2m high truss shown, find the forces in bars FH, FB, and BC. Use $F = 10$ kN. Now pretend that bars FC and CG are removed and two new bars BH and HD are put in. Find the forces in bars FH, FB, and BC again. Are the forces different now? Why?



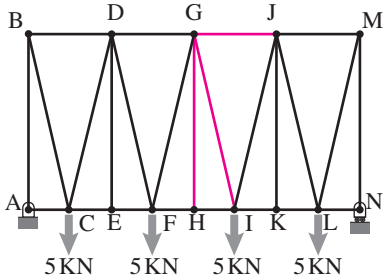
Problem 6.2.8

6.2.9 Find the forces in bars BC and BD in the truss shown in the figure. How does the force change in each of these bars if the load is moved to joint B from joint E?



Problem 6.2.9

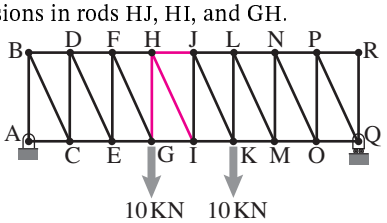
6.2.10 For the truss shown in the figure, assume that AC=CE=1 m, and AB=BD=2 m. The rest of the bays are identical to bay ABDE. For the given loads, find the tensions in rods GH, GI, and GJ. [Hint: you can use information about zero-force members.]



Problem 6.2.10

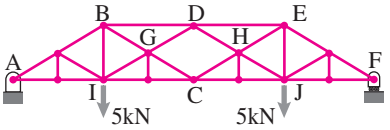
6.2.11 Consider the truss shown in Problem 6.2.6. Find the tension in rod CH. [Hint: you may have to use multiple sections or solve Problem 6.2.6 first.]

6.2.12 The truss shown in the figure consists of 8 'N' bays. In each bay, the vertical rod is 2 m long and the horizontal rod is 1 m long. For the given loads, find the tensions in rods HJ, HI, and GH.



Problem 6.2.12

6.2.13 A complex symmetric truss spanning a length of 16 m is shown in the figure. The outermost inclined rods make an angle of 30° with the horizontal. Find the tension in rod BD. [Note: you may have to use more than one section to get the answer.]



Problem 6.2.13

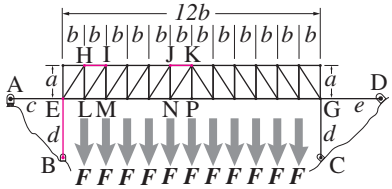
6.2.14 The 2D truss shown consists of 12 diagonally braced rectangles (each a high and b wide). Thus the slope of the diagonal elements is a/b. The whole structure is supported by 4 bars (with lengths c, d, and e as marked). The loading is idealized as 11 identical loads F shown. Give your answers in terms of some or all of a, b, c, d, e and F.

a) On a sketch of the figure below clearly mark all the zero-force members (put a '0' on the middle of each bar that has a 'bar force' of zero).

b) Find the 'bar-force' in bar EB. *

c) Find the 'bar-force' in bar HI. *

d) Find the 'bar-force' in bar JK. [Hint: Use the method of sections and, to reduce calculations, replace a group of the F forces with a single equivalent force.] *



Problem 6.2.14