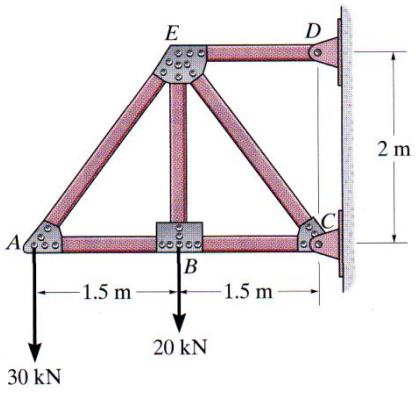
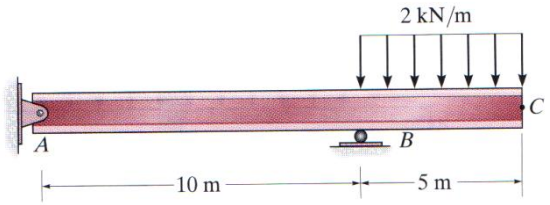
CE 383 STRUCTURAL ANALYSIS
2012 Spring Semester

Problem Set # 2

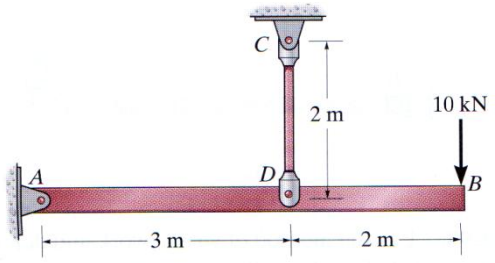
Q.1. (Hibbeler, 6th edition, P9-22)
Use unit dummy load method and determine the vertical displacement of point *B*. Each A-36 steel member has a cross-sectional area of 400 mm^2.
E = 200 GPa



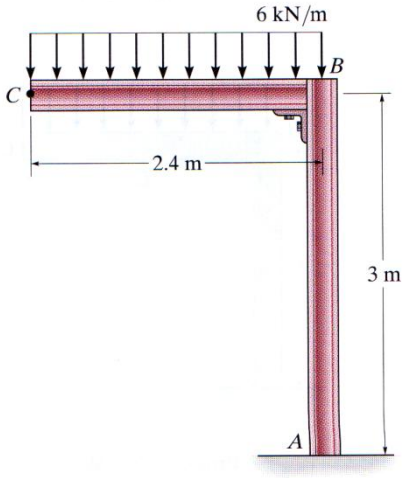
Q.2. (Hibbeler 6th edition, P9-64 and P9-67)
Use unit dummy load method and determine the displacement at *C* and the slope at *B* of the steel beam.
E =200 GPa, I = 70 (10^6) mm^4.



Q.3. (Hibbeler 6th edition, P9-78)
Beam *AB* has a square cross section of 100 mm by 100 mm. Bar *CD* has a diameter of 10 mm. If both members are made of steel, determine the vertical displacement of point *B* due to the loading of 10 kN. Use unit dummy load method.
E = 200 GPa.

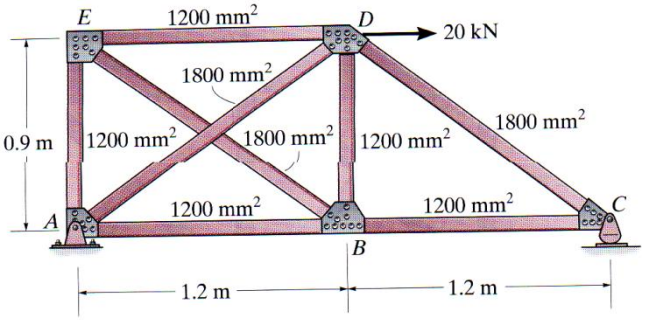


Q.4. (Hibbeler 6th edition, P9-84)
Use unit dummy load method and determine the horizontal and vertical displacements of point *C*. there is a fixed support at *A* and fixed joint at *B*. *EI* is constant.

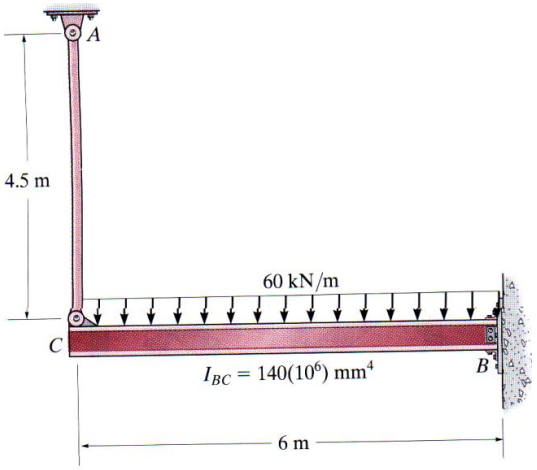


Q.5. (Hibbeler 6th edition, P10-32)
Determine the force in member *AD* of the truss. Take E = 200 GPa. The cross sectional area of each member is shown in the figure. Assume the members are pin connected at their end points.

b) Find the horizontal deflection at *D*.

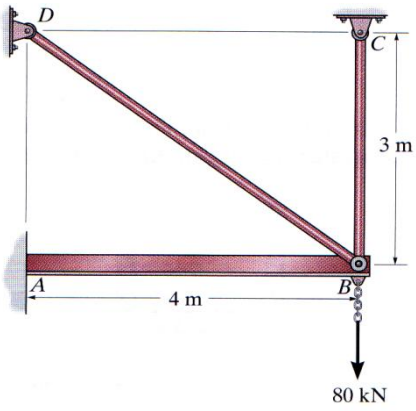


Q.6. (Hibbeler 6th edition, P10-34)
The cantilevered beam is supported at one end by a ***500 mm²*** area of suspender rod *AC* and fixed at the other end *B*. Determine the force in the rod due to a uniform loading of 60 kN/m. E= 200 GPa for both the beam and the rod.
b) Find the vertical deflection at C.



Q.7. (Hibbeler 6th edition, P10-39)

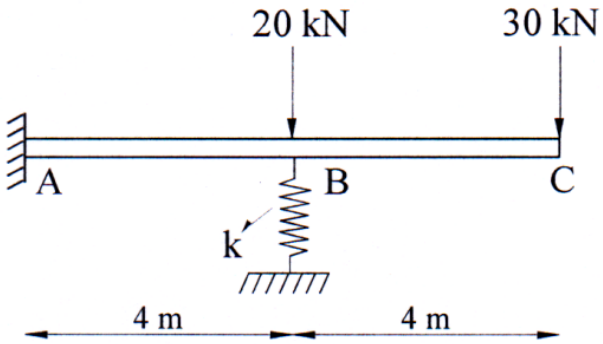
The cantilevered beam *AB* is additionally supported using two tie rods. Determine the force in each of these rods. Neglect axial compression and shear in the beam. For the beam, I_b = 200 (10^6) mm^4, and for each tie rod, A = 100 mm^2. Take E = 200 GPa.



Q.8.

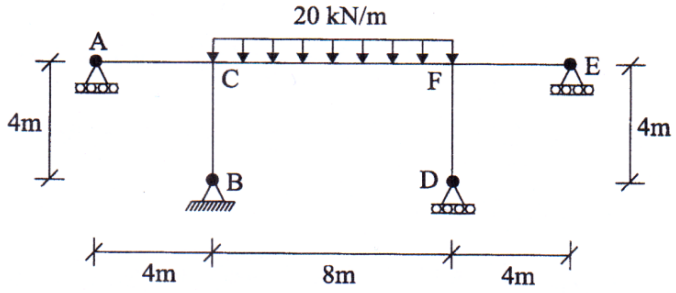
a) Solve the system with the cantilever ABC supported by the spring at B and draw the moment diagram for the cantilever. Given E = $2x10^8$ kN/m^2, I = $5x10^{-5}$ m^4 and the spring constant k = 2000 kN/m.

b) Using the Reduction Theorem, calculate the vertical deflection at C.



Q.9.

Analyze the symmetric frame using The Force Method. Show all the support reactions on a clear figure and draw the bending moment diagram. Take reactions at A and E as the redundants. (EI constant).



Q.10.

Analyze the continuous beam by selecting the internal moment at B as redundant. EI is constant.