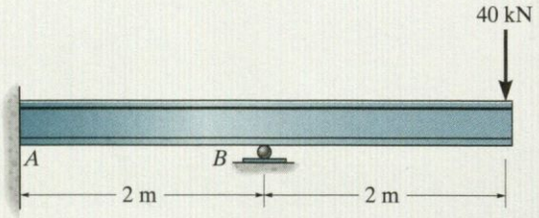
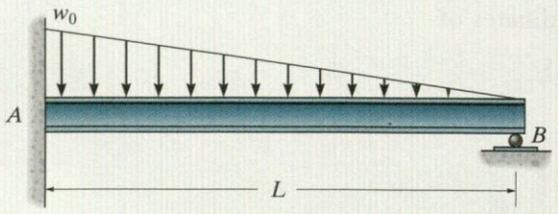
FUNDAMENTAL PROBLEMS

F10–1. Determine the reactions at the fixed support at A and the roller at B. EI is constant.



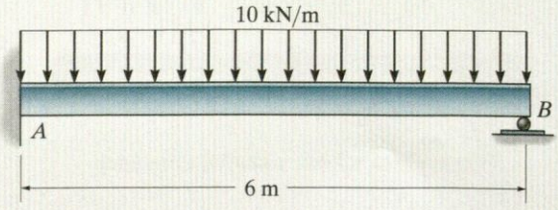
F10–1

F10–2. Determine the reactions at the fixed supports at A and the roller at B. EI is constant.



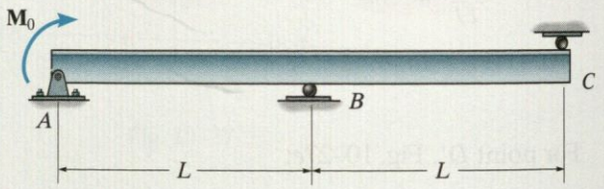
F10–2

F10–3. Determine the reactions at the fixed support at A and the roller at B. Support B settles 5 mm. Take $E = 200$ GPa and $I = 300(10^6)\,\text{mm}^4$.



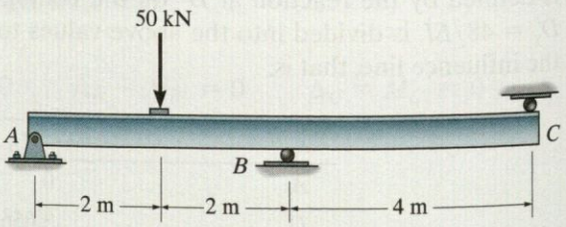
F10–3

F10–4. Determine the reactions at the pin at A and the rollers at B and C.



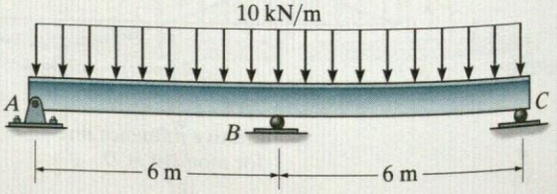
F10–4

F10–5. Determine the reactions at the pin A and the rollers at B and C on the beam. EI is constant.



F10–5

F10–6. Determine the reactions at the pin at A and the rollers at B and C on the beam. Support B settles 5 mm. Take $E = 200$ GPa, $I = 300(10^6)\,\text{mm}^4$.



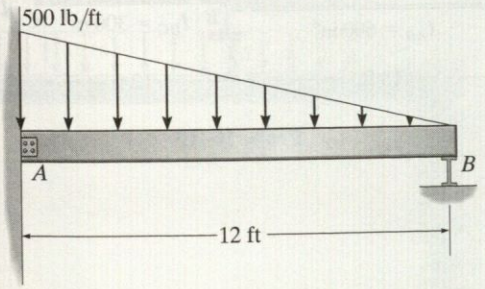
F10–6

10

PROBLEMS

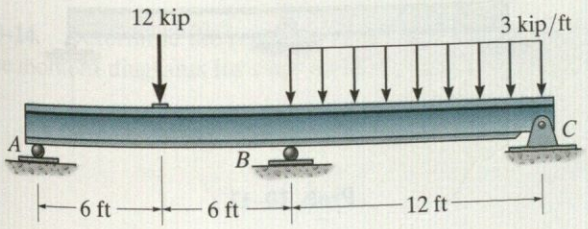
Sec. 10.1–10.4

10–1. Determine the reactions at the supports then draw the moment diagram. Assume the support at B is a roller.



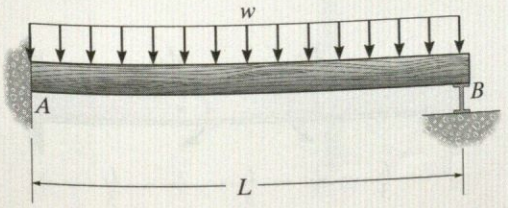
Prob. 10–1

10–2. Determine the reactions at the supports A, B, and C, then draw the shear and moment diagrams. EI is constant.



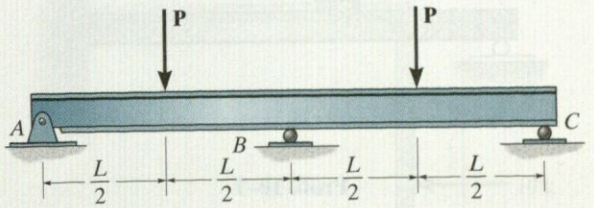
Prob. 10–2

10–3. Determine the reactions at the supports, then draw the moment diagram. Assume the support at B is a roller. EI is constant.



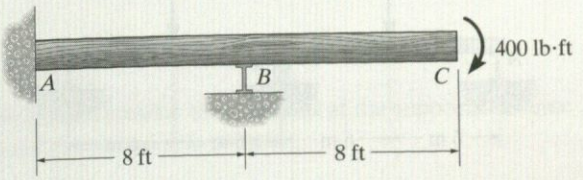
Prob. 10–3

***10–4.** Determine the reactions at the supports A, B, and C; then draw the shear and moment diagram. EI is constant.



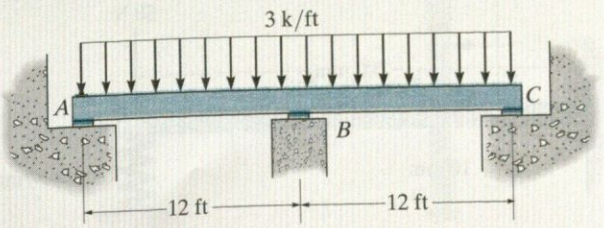
Prob. 10–4

10–5. Determine the reactions at the supports, then draw the moment diagram. Assume the support at B is a roller. EI is constant.



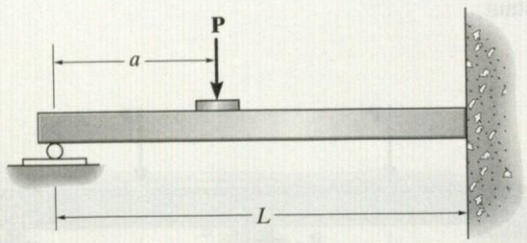
Prob. 10–5

10–6. Determine the reactions at the supports, then draw the moment diagram. Assume B and C are rollers and A is pinned. The support at B settles downward 0.25 ft. Take $E = 29(10^3)$ ksi, $I = 500$ in^4.



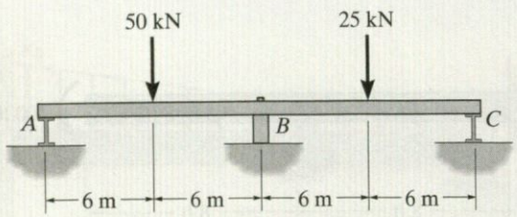
Prob. 10–6

10–7. Determine the value of a so that the maximum positive moment has the same magnitude as the maximum negative moment. EI is constant.



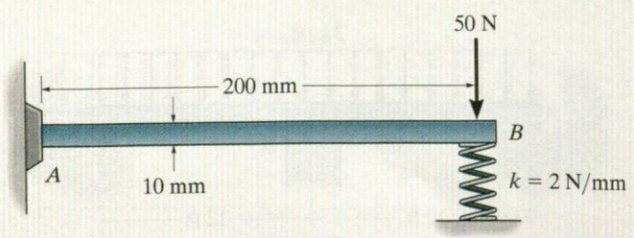
Prob. 10–7

***10–8.** Draw the moment diagram. Assume A and C are rollers and B is pinned. EI is constant.



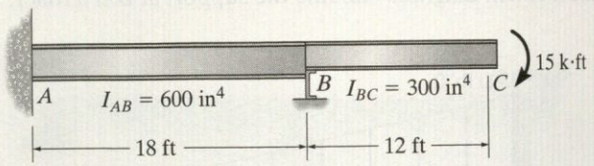
Prob. 10–8

10–9. Draw the moment diagram for the beam. Assume the support at A is fixed and B and C are rollers. EI is constant. Use the three-moment equation.



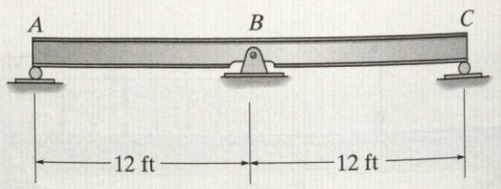
Prob. 10–9

10–10. Determine the reactions at the supports. The moment of inertia for each segment is shown in the figure. Assume the support at B is a roller. Take $E = 29(10^3)$ ksi.



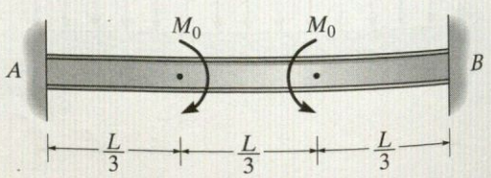
Prob. 10–10

10–11. If the pin support B settles 0.5 in., determine the maximum moment developed in the beam. Take $E = 29(10^3)$ ksi, $I = 300$ in^4.



Prob. 10–11

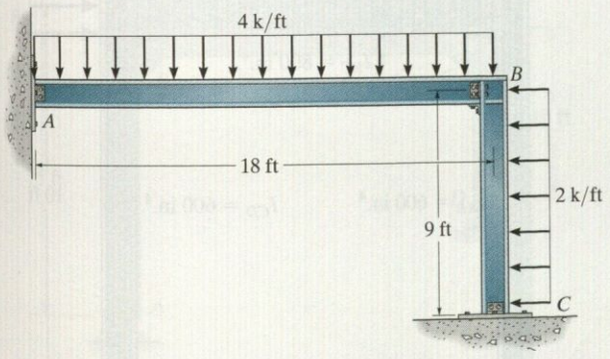
***10–12.** Determine the moment reactions at the supports A and B, then draw the moment diagram. EI is constant.



Prob. 10–12

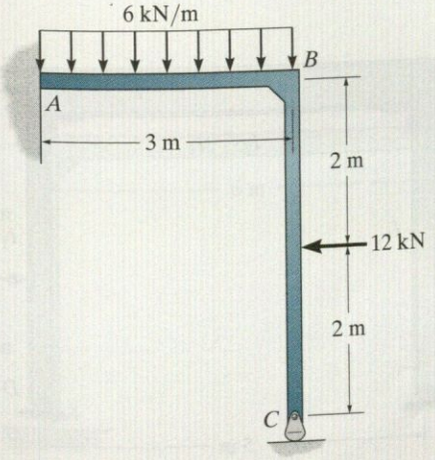
Sec. 10.5

10–13. Determine the reactions at the supports. Assume A and C are pins and the joint at B is fixed connected. EI is constant.



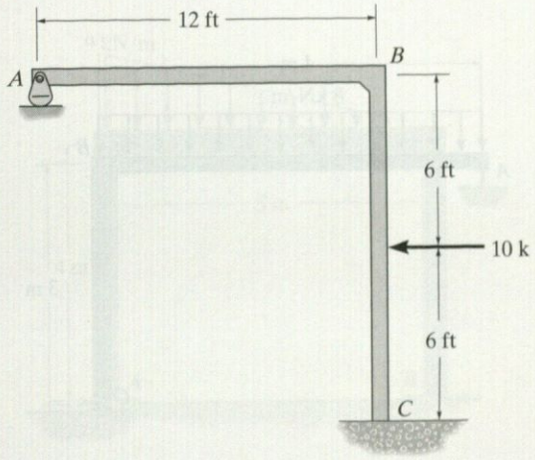
Prob. 10–13

10–14. Determine the reactions at the supports, then draw the moment diagrams for each member. EI is constant.



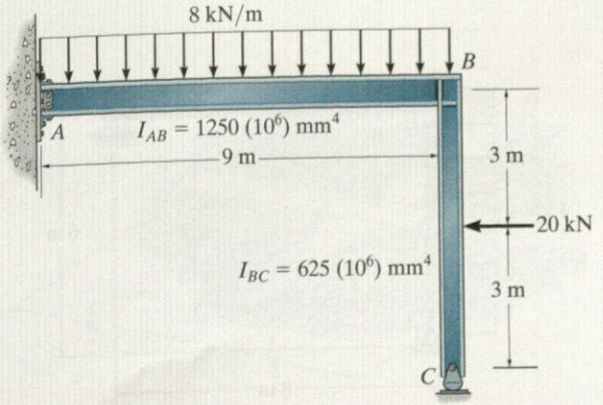
Prob. 10–14

10–15. Determine the reactions at the supports, then draw the moment diagram for each member. EI is constant.



Prob. 10–15

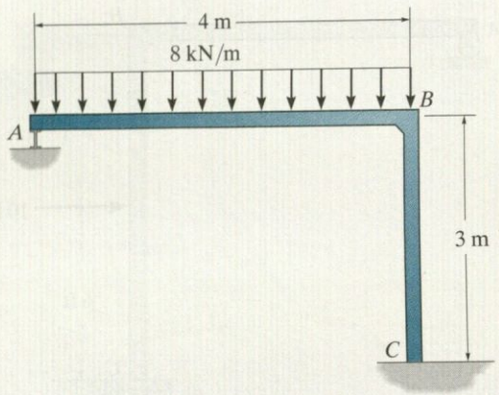
***10–16.** Determine the reactions at the supports. Assume A is fixed connected. E is constant.



Prob. 10–16

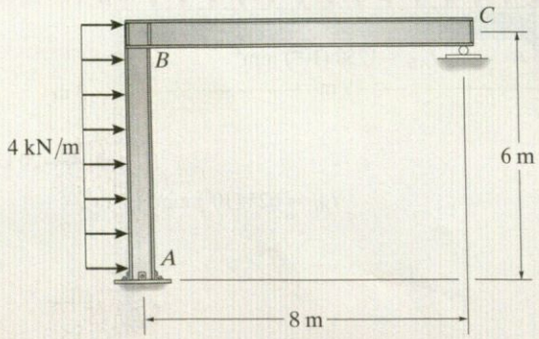
10

10–17. Determine the reactions at the supports, then draw the moment diagram for each member. *EI* is constant.



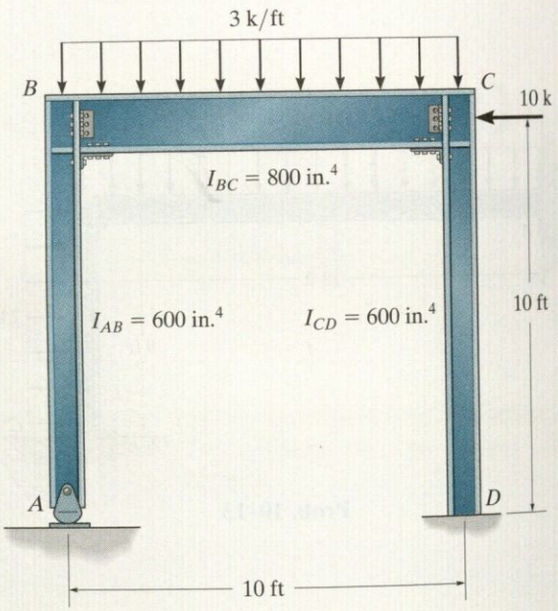
Prob. 10–17

10–18. Determine the reactions at the supports. Assume *A* is a fixed and the joint at *B* is fixed connected. *EI* is constant.



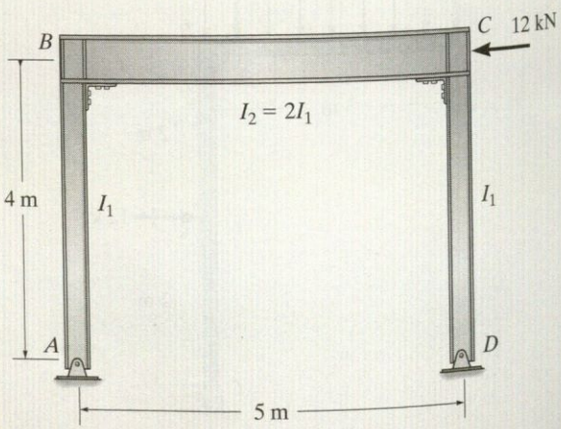
Prob. 10–18

10–19. Determine the reactions at the supports. *E* is constant.



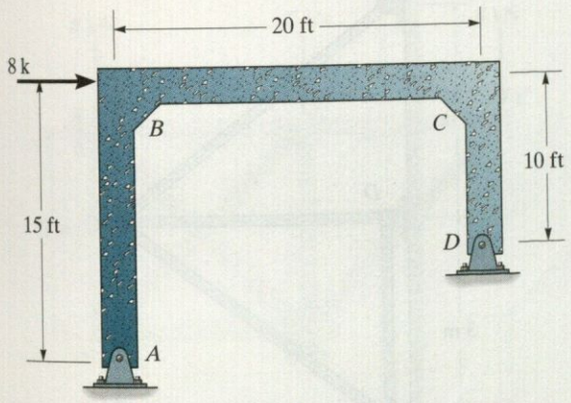
Prob. 10–19

***10–20.** Determine the reactions at the supports, then draw the moment diagram for each member. *EI* is constant.



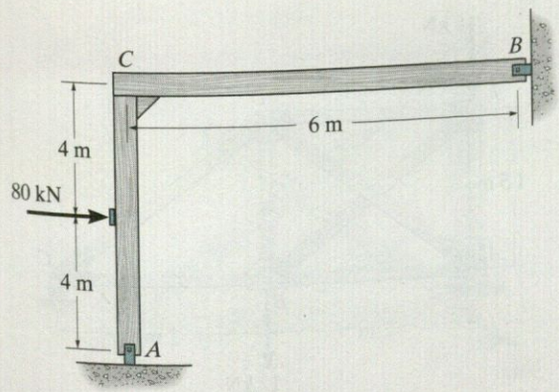
Prob. 10–20

10–21. Determine the reactions at the supports. Assume A and D are pins. EI is constant.



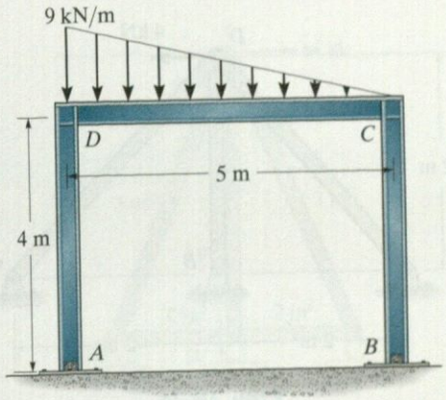
Prob. 10–21

10–22. Determine the reactions at the supports, then draw the moment diagrams for each member. Assume A and B are pins and the joint at C is fixed connected. EI is constant.



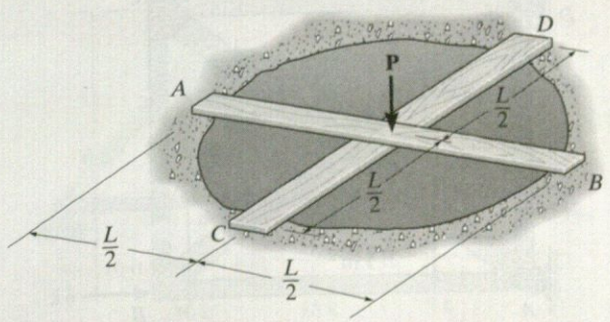
Prob. 10–22

10–23. Determine the reactions at the supports. Assume A and B are pins. EI is constant.



Prob. 10–23

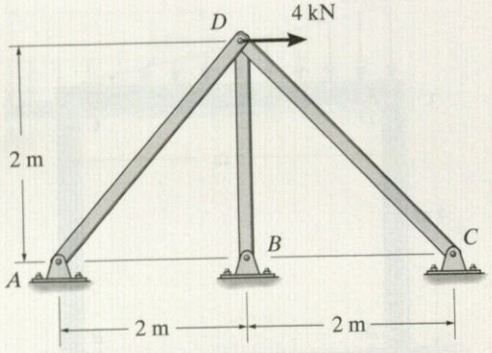
***10–24.** Two boards each having the same EI and length L are crossed perpendicular to each other as shown. Determine the vertical reactions at the supports. Assume the boards just touch each other before the load **P** is applied.



Prob. 10–24

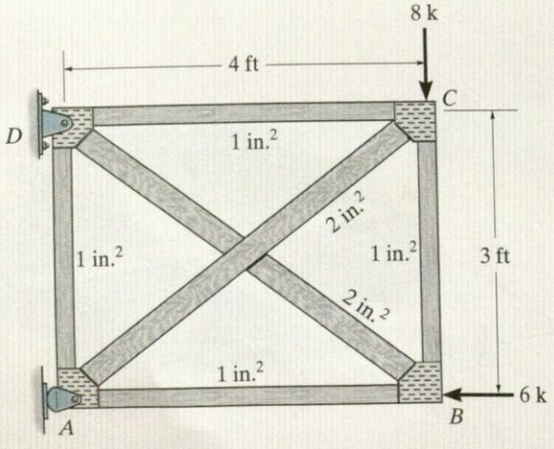
Sec. 10.6

10–25. Determine the force in each member. AE is constant.



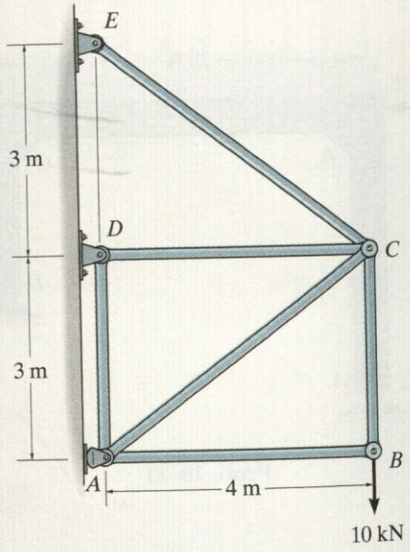
Prob. 10–25

10–26. Determine the force in each member of the truss. The cross-sectional area of each member is indicated in the figure. $E = 29(10^3)$ ksi. Assume the members are pin connected at their ends.



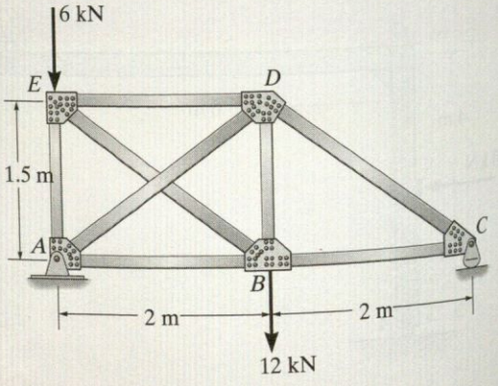
Prob. 10–26

10–27. Determine the force in member AC of the truss. AE is constant.



Prob. 10–27

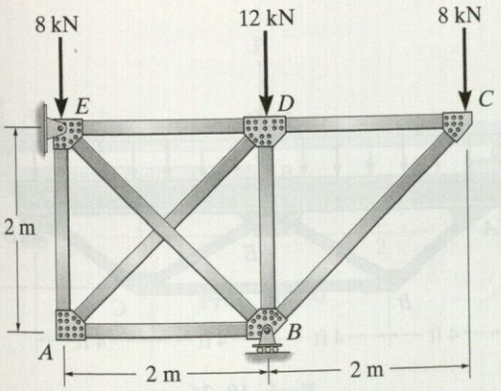
***10–28.** Determine the force in member BE of the pin-connected truss. AE is constant.



Prob. 10–28

10

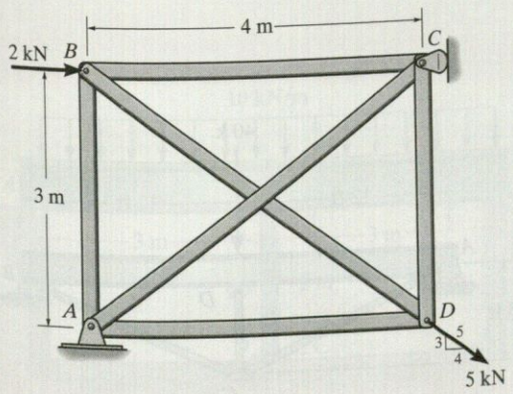
10–29. Determine the force in member AD of the pin-connected truss. AE is constant.



Prob. 10–29

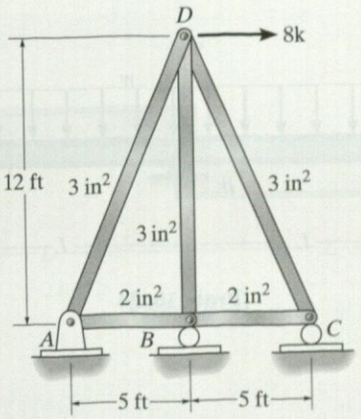
10–30. Determine the force in member BD. AE is constant.

10–31. Determine the force in member BC. AE is constant.



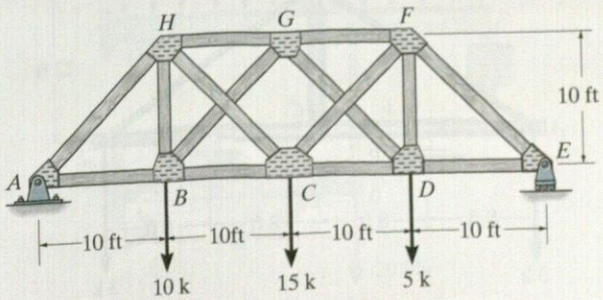
Probs. 10–30/31

***10–32.** Determine the force in each member of the truss. AE is constant.



Prob. 10–32

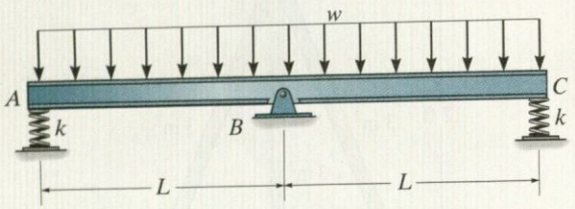
10–33. Determine the force in member GB of the truss. AE is constant.



Prob. 10–33

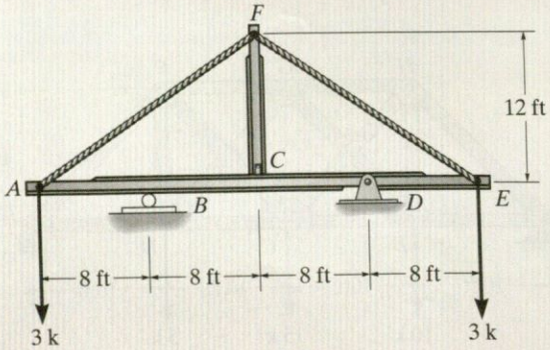
Sec. 10.7

10–34. Determine the reactions at the supports, then draw the moment diagram. Each spring is originally unstretched and has a stiffness $k = 12\,EI/L^3$. EI is constant.



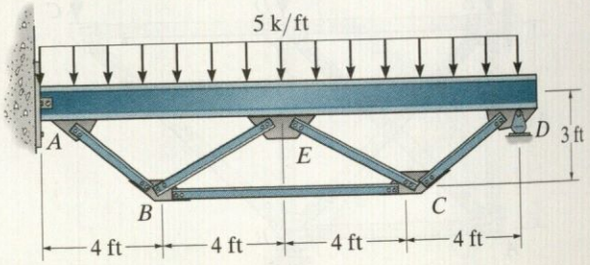
Prob. 10–34

10–35. The trussed beam supports the two loads of 3 k. If the two cables have a cross sectional area of 0.5 in^2 and the strut CF has a cross sectional area of 3 in^2, determine the force in the strut. Neglect both the depth and axial compression in the beam. Take $E = 29(10^3)$ ksi for all members. Also, $I_{AE} = 450$ in^4.



Prob. 10–35

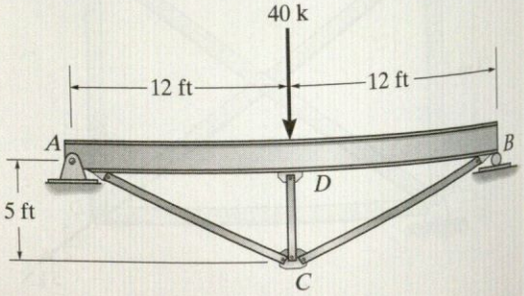
***10–36.** The trussed beam supports the uniform distributed loading. If all the truss members have a cross-sectional area of 1.25 in^2, determine the force in member BC. Neglect both the depth and axial compression in the beam. Take $E = 29(10^3)$ ksi for all members. Also, for the beam $I_{AD} = 750$ in^4. Assume A is a pin and D is a rocker.



Prob. 10–36

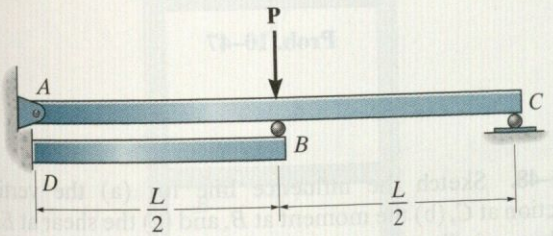
10–37. The king-post trussed beam supports a concentrated force of 40 k at its center. Determine the force in each of the three struts. The struts each have a cross-sectional area of 2 in^2. Assume they are pin connected at their end points. Neglect both the depth of the beam and the effect of axial compression in the beam. Take $E = 29(10^3)$ ksi for both the beam and struts. Also, $I_{AB} = 400$ in^4.

10–38. Determine the maximum moment in the beam in Prob. 10–37.



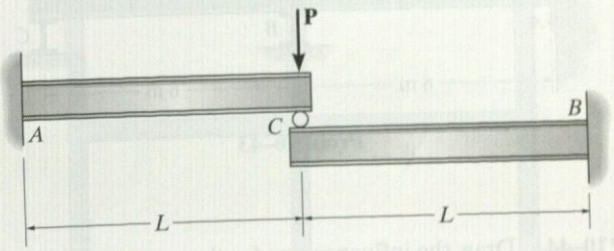
Probs. 10–37/38

10–39. Determine the reactions at the fixed support D. EI is constant for both beams.



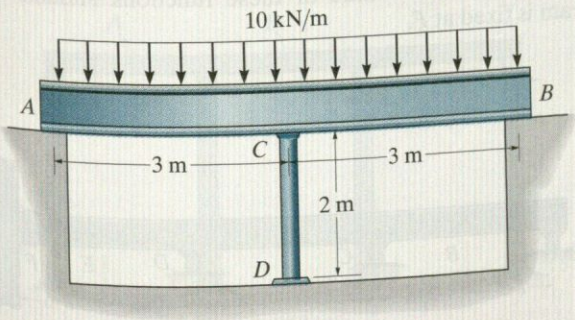
Prob. 10–39

10–41. The compound beam segments meet in the center using a smooth contact (roller). Determine the reactions at the fixed supports A and B when the load **P** is applied. EI is constant.



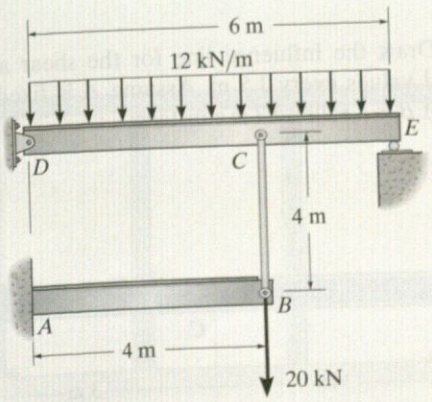
Prob. 10–41

***10–40.** The beam AB has a moment of inertia $I = 800(10^6)\text{mm}^4$, and rests on the smooth supports at its ends. A 50 mm in diameter post CD is placed at the center of the beam. If the temperature of the rod is increased by 100 °C, determine the force developed in the rod. The beam and rod are both made of steel for which $E = 200$ GPa and $\alpha = 11.7(10^{-6})/°\text{C}$.



Prob. 10–40

10–42. The structural assembly supports the loading shown. Draw the moment diagrams for each of the beams. Take $I = 100(10^6)\text{ mm}^4$ for the beams and $A = 200\text{ mm}^2$ for the tie rod. All members are made of steel for which $E = 200$ GPa.



Prob. 10–42

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