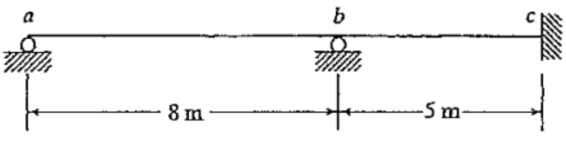
(2)

a.

EXAMPLE 5.11

The beam of Example 4.8 is supported as shown. The support at b settles 15 mm, carrying the beam with it.

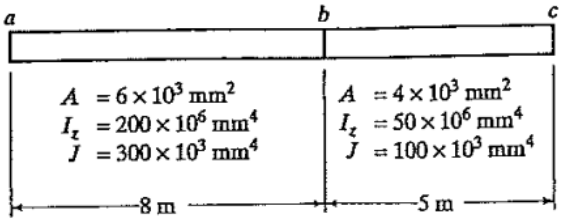
1. Calculate the displacements at a and b.
2. Calculate the reactions.



EXAMPLE 4.8

For the system shown:

1. Write the element stiffness matrices—assume no bending normal to the plane of the paper.
2. Assemble the global stiffness equations. $E = 200{,}000$ MPa and $\nu = 0.3$.

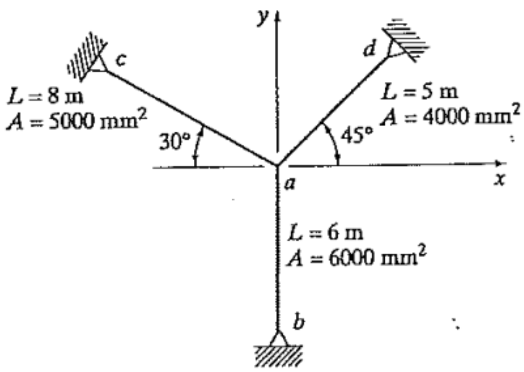


b.

EXAMPLE 5.12

In the pin-jointed truss shown, all bars are cooled 20°C. $\alpha = 1.2 \times 10^{-5}$ mm/mm°C. $E = 200{,}000$ MPa.

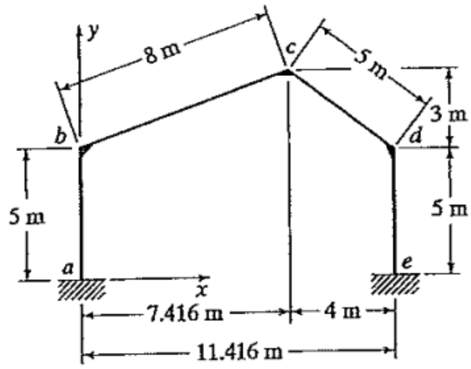
1. Calculate the displacement at a.
2. Calculate the reactions.
3. Reduce the thermal displacement under uniform temperature change to zero by suitably altering the areas of bars ac and ad.



c.

EXAMPLE 5.3

The rigid frame shown has $E = 200{,}000$ MPa and the following member properties: for ab, cd, ed, $A = 4 \times 10^3$ mm^2, $I = 50 \times 10^6$ mm^4; for bc, $A = 6 \times 10^3$ mm^2, $I = 200 \times 10^6$ mm^4. Using the results of Example 4.8 and the transformation matrix of Equation 5.2, develop the global stiffness equations for the structure, including flexural and axial deformations.



d.

EXAMPLE 5.4

A pin-jointed space truss is supported and loaded as shown. $E = 200{,}000$ MPa. Bar areas are:

$$A_{ab} = 20 \times 10^3 \text{ mm}^2$$
$$A_{ac} = 30 \times 10^3 \text{ mm}^2$$
$$A_{ad} = 40 \times 10^3 \text{ mm}^2$$
$$A_{ae} = 30 \times 10^3 \text{ mm}^2$$

1. Calculate the displacement at a.
2. Calculate the reactions.