Chapter 10
Structural vibration
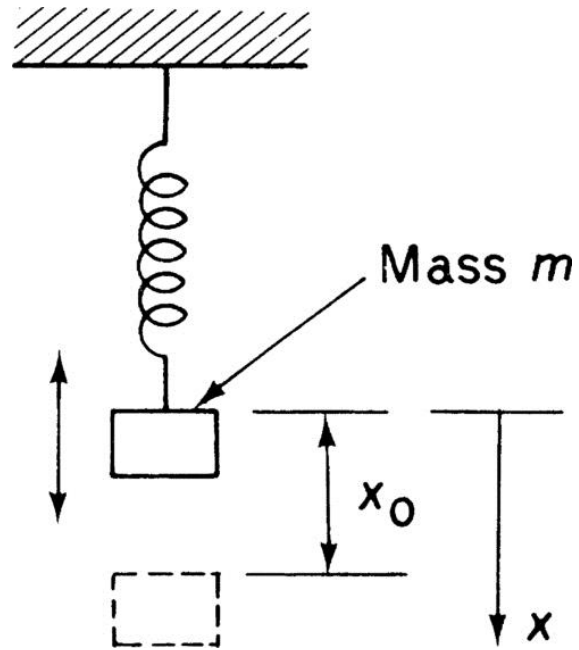
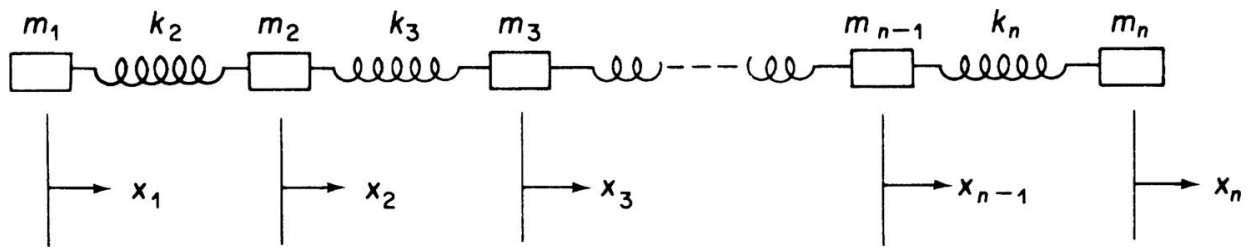**FIGURE 10.1** Oscillation of a Mass–Spring System

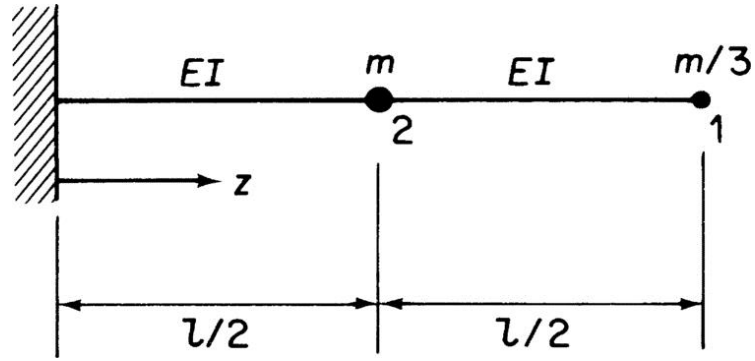**FIGURE 10.2** Oscillation of an *n* Mass–Spring System

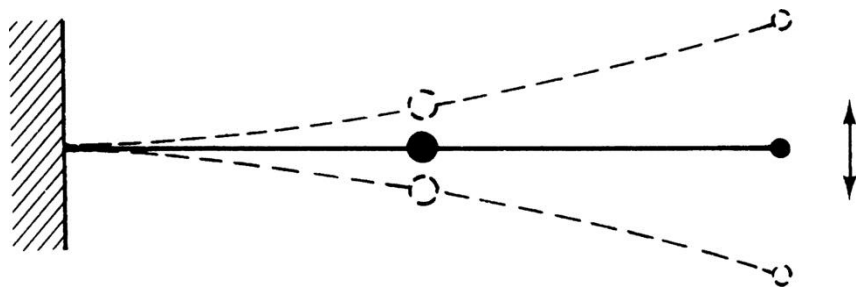**FIGURE 10.3** Mass–Beam System for Example 10.1

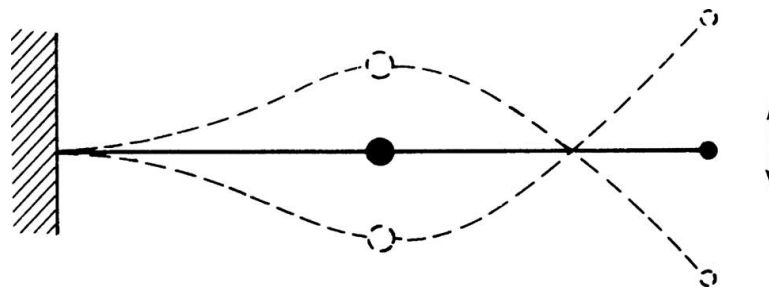**FIGURE 10.4** The First Natural Mode of the Mass–Beam System of Fig. 10.3

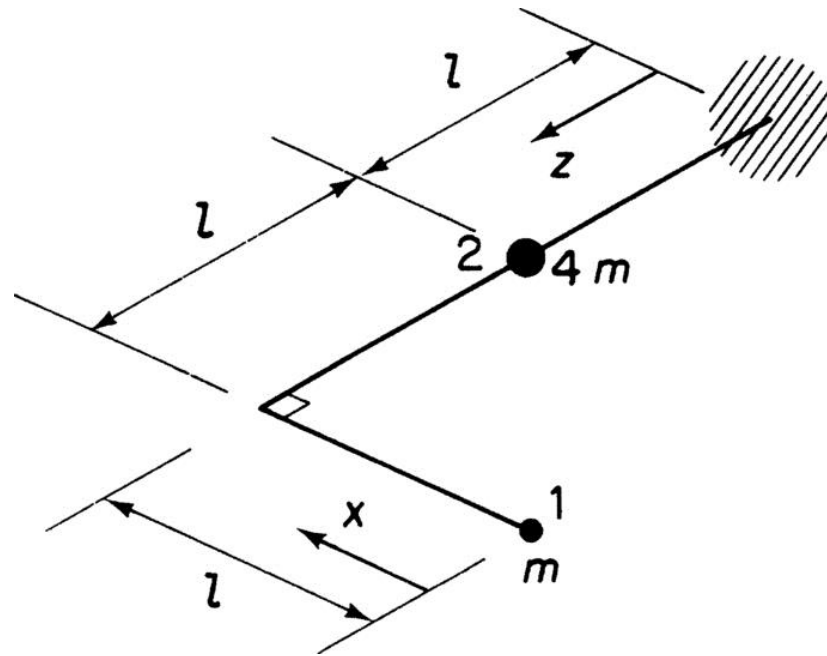**FIGURE 10.5** The Second Natural Mode of the Mass–Beam System of Fig. 10.3
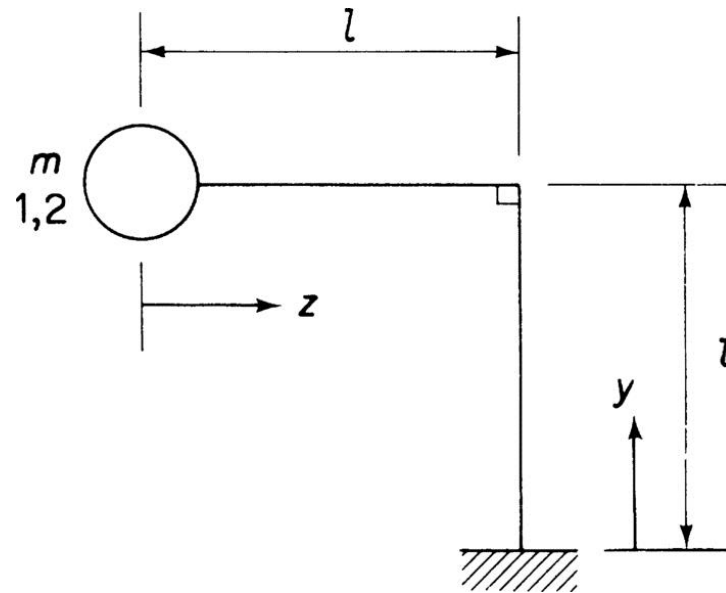
FIGURE 10.6 Mass–Beam System for Example 10.2
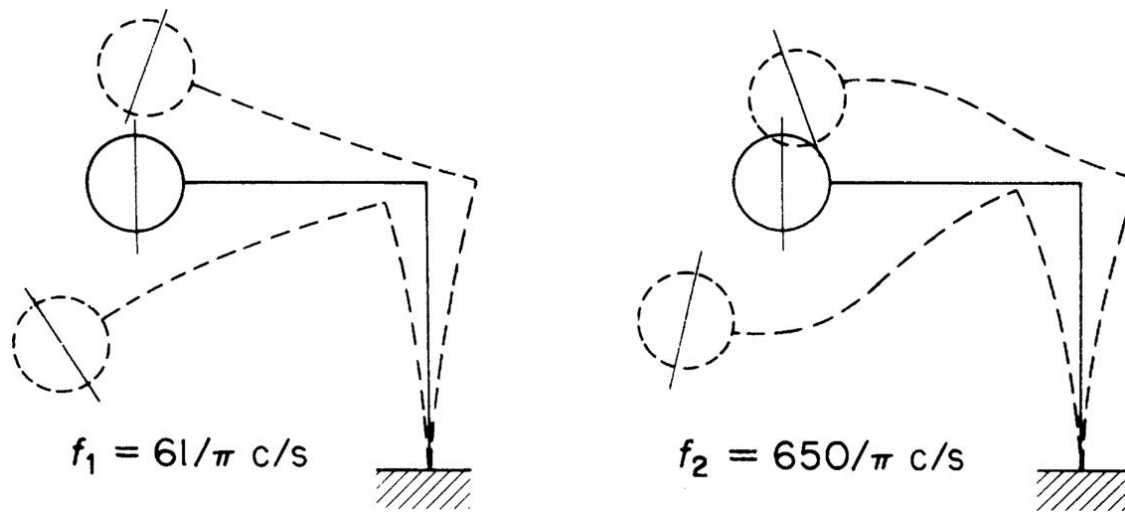
FIGURE 10.7 Mass–Beam System for Example 10.3

FIGURE 10.8 The First Two Natural Modes of Vibration of the Beam–Mass System of Fig. 10.7
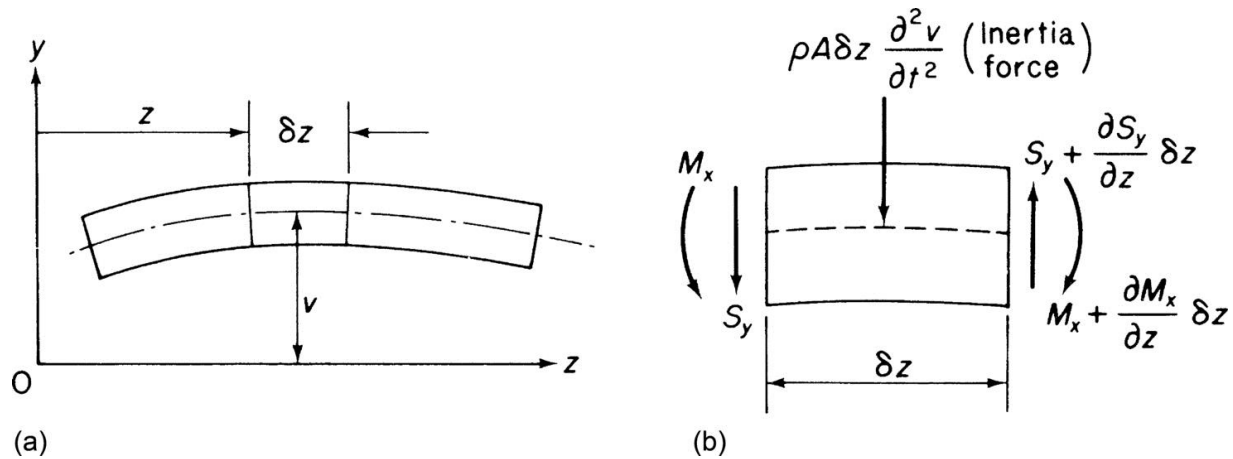
In the figure, the left mode shows $f_1 = 6l/\pi$ c/s and the right mode shows $f_2 = 650/\pi$ c/s.

FIGURE 10.9 Vibration of a Beam Possessing Mass

FIGURE 10.10 Beam of Example 10.4

$$f_1 = \frac{\pi}{2L^2} \sqrt{\frac{EI}{\rho A}}$$

(a)

$$f_2 = \frac{2\pi}{L^2} \sqrt{\frac{EI}{\rho A}}$$
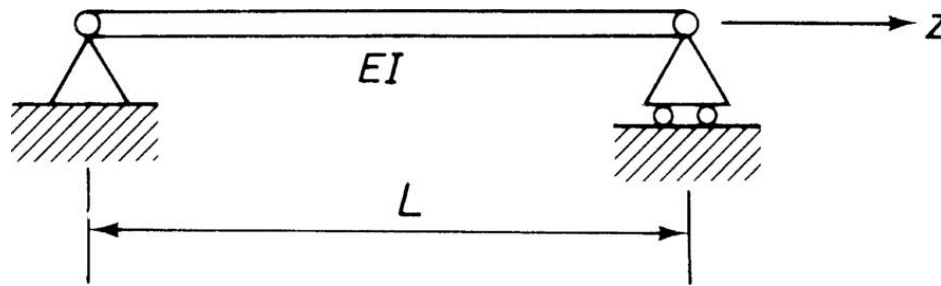
(b)

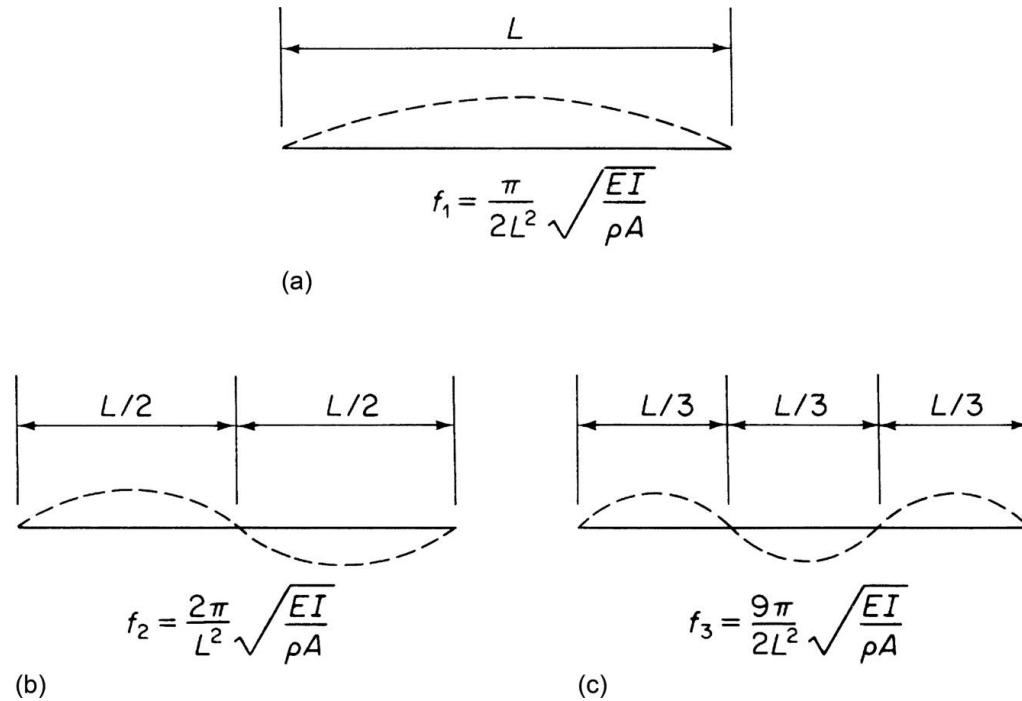$$f_3 = \frac{9\pi}{2L^2} \sqrt{\frac{EI}{\rho A}}$$

(c)

FIGURE 10.11 First Three Normal Modes of Vibration of the Beam of Example 10.4
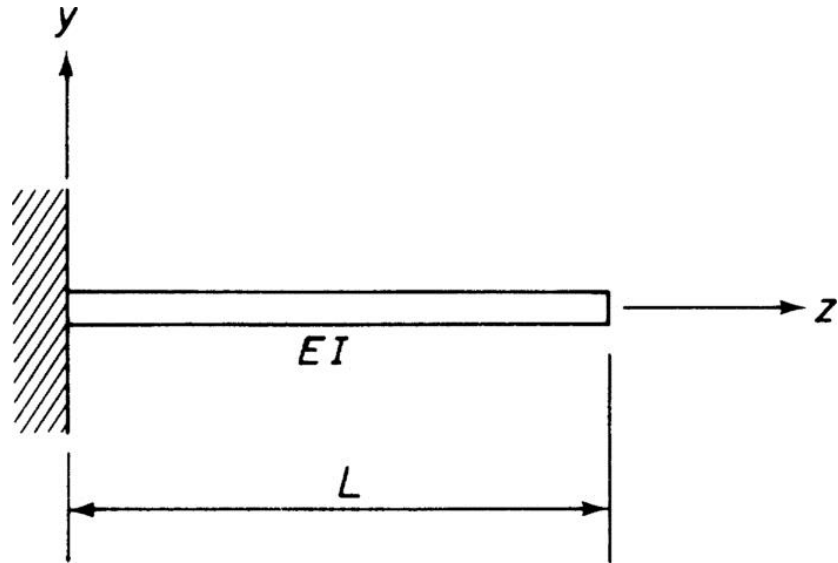
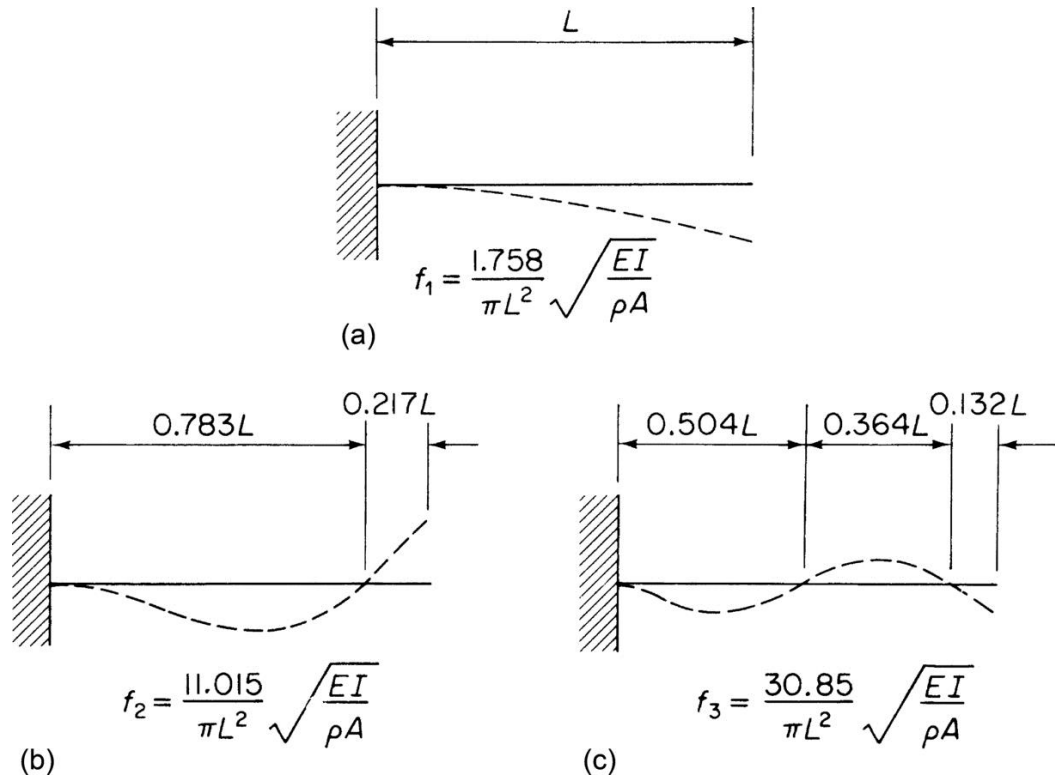**FIGURE 10.12** Cantilever Beam of Example 10.5

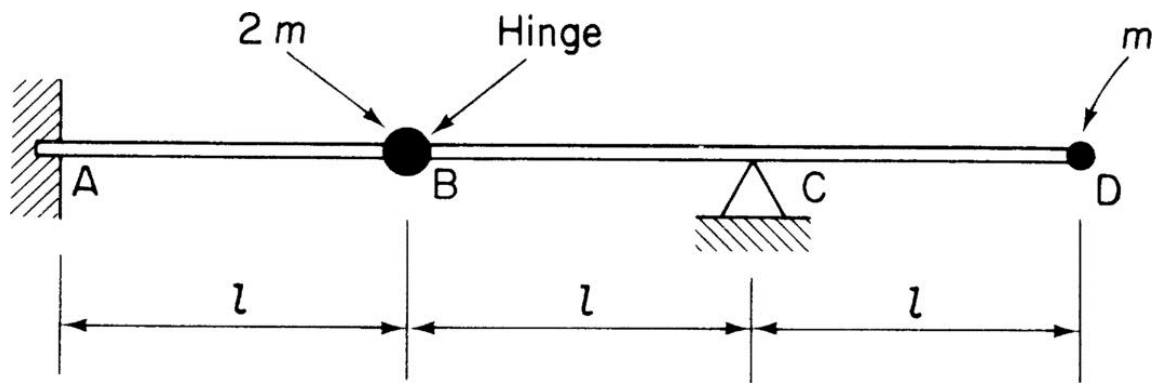**FIGURE 10.13** The First Three Normal Modes of Vibration of the Cantilever Beam of Example 10.5
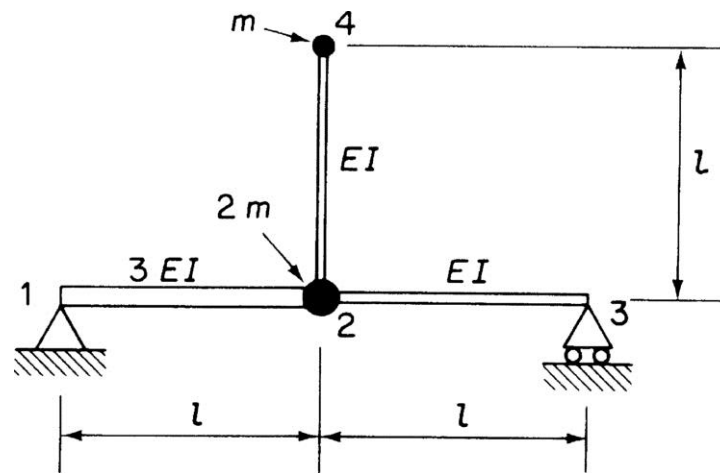
FIGURE P.10.1

FIGURE P.10.2

FIGURE P.10.3
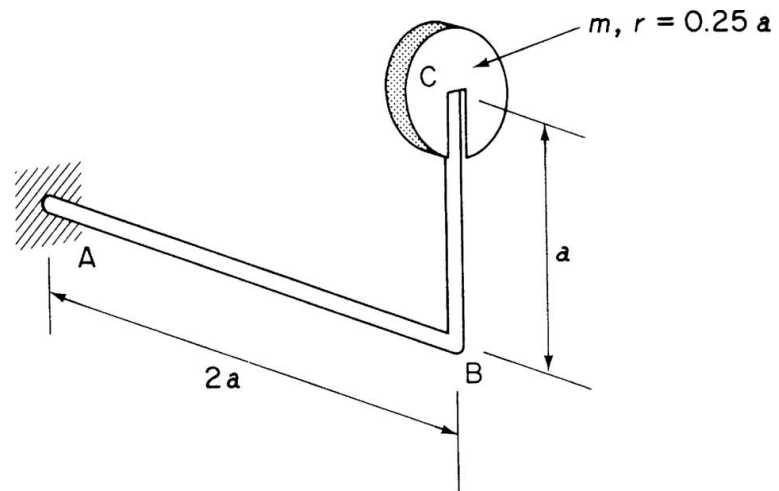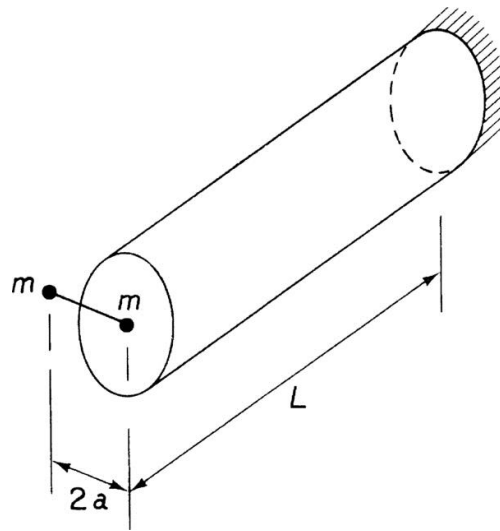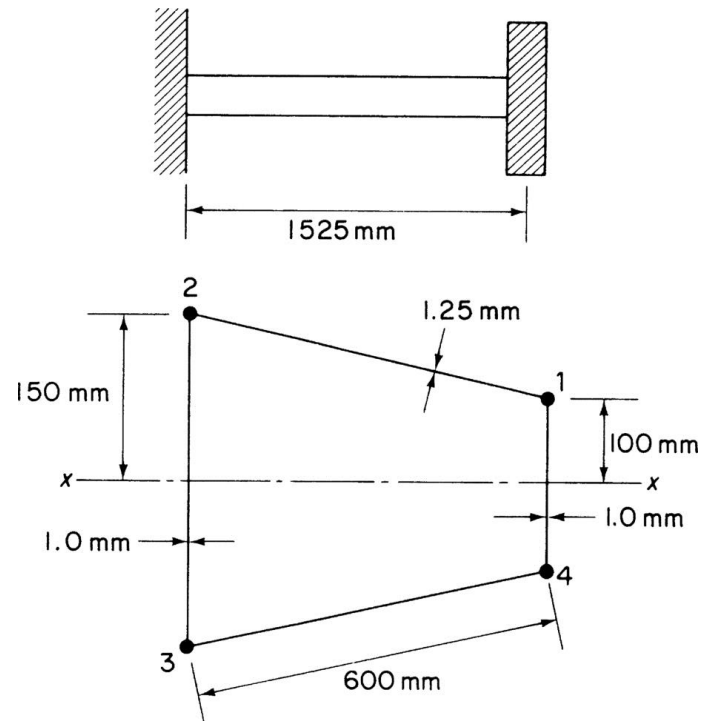
FIGURE P.10.4

FIGURE P.10.5

FIGURE P.10.6