



Figure 5.4.3 (a) Geometry and loading, and (b) member forces in the plane frame structure of Example 5.4.1.

$$[K^1] = 10^5 \begin{bmatrix} 0.0004 & 0.0000 & -0.0289 & -0.0004 & 0.0000 & -0.0289 \\ 0.0000 & 0.6944 & 0.0000 & 0.0000 & -0.6944 & 0.0000 \\ -0.0289 & 0.0000 & 2.7778 & 0.0289 & 0.0000 & 1.3889 \\ -0.0004 & 0.0000 & 0.0289 & 0.0004 & 0.0000 & 0.0289 \\ 0.0000 & -0.6944 & 0.0000 & 0.0000 & 0.6944 & 0.0000 \\ -0.0289 & 0.0000 & 1.3889 & 0.0289 & 0.0000 & 2.7778 \end{bmatrix}$$

$$\{f^1\} = P\{1.0 \quad 0.0 \quad -24.0 \quad 1.0 \quad 0.0 \quad 24.0\}^T$$

Element 2.

$$L = 180 \text{ in.}, \quad A = 10 \text{ in.}^2, \quad I = 10 \text{ in.}^4, \quad \cos \alpha_2 = 0.8, \quad \sin \alpha_2 = -0.6$$

$$E = 10^6 \text{ psi}, \quad f^{(2)} = 0, \quad q^{(2)} = 0 \quad (5.4.12)$$

The load $F_0 = 4P$ at the center of the element ($\cos \alpha = -0.6$ and $\sin \alpha = 0.8$) is distributed to the nodes according to Eq. (5.2.20).

$$[K^2] = 10^5 \begin{bmatrix} 0.3556 & -0.2666 & -0.0111 & -0.3556 & 0.2666 & -0.0111 \\ -0.2666 & 0.2001 & -0.0148 & 0.2666 & -0.2001 & -0.0148 \\ -0.0111 & 0.0148 & 2.2222 & 0.0111 & 0.0148 & 1.1111 \\ -0.3556 & 0.2666 & 0.0111 & 0.3556 & -0.2666 & 0.0111 \\ 0.2666 & -0.2001 & 0.0148 & -0.2666 & 0.2001 & 0.0148 \\ -0.0111 & -0.0148 & 1.1111 & 0.0111 & 0.0148 & 2.2222 \end{bmatrix}$$

$$\{f^2\} = P\{0.0 \quad 2.0 \quad -72.0 \quad 0.0 \quad 2.0 \quad 72.0\}^T$$