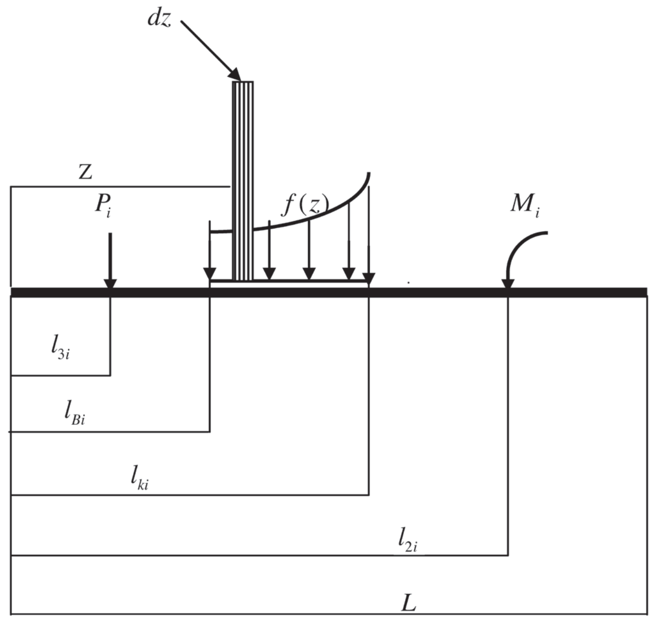

Figure 5.3

$$EI\frac{d^3y}{dx^3} = -a_0x - \frac{2a_1}{L}\frac{\left(x-\frac{L}{2}\right)^2}{2!} - \frac{8a_2}{L^2}\frac{\left(x-\frac{L}{2}\right)^3}{3!} - \frac{48a_3}{L^3}\frac{\left(x-\frac{L}{2}\right)^4}{4!} + \\ + \sum\Gamma_{l_{Bi}}\int_{l_{Bi}}^{x} f(z)\,dz - \sum\Gamma_{l_{ki}}\int_{l_{ki}}^{x} f(z)\,dz + \sum\Gamma'_{l_{2i}}M_i + \sum\Gamma_{l_{3i}}P + D_3 \tag{5.5}$$

$$I\frac{d^2y}{dx^2} = -\frac{a_0}{2!}x - \frac{2a_1}{L}\frac{\left(x-\frac{L}{2}\right)^3}{3!} - \frac{8a_2}{L^2}\frac{\left(x-\frac{L}{2}\right)^4}{4!} - \frac{48a_3}{L^3}\frac{\left(x-\frac{L}{2}\right)^5}{5!} \\ + \sum\Gamma_{l_{Bi}}\int_{l_{Bi}}^{x} f(z)\,(x-z)\,dz - \sum\Gamma_{l_{ki}}\int_{l_{ki}}^{x} f(z)\,(x-z)\,dz + \sum\Gamma'_{l_{2i}}\,M_i \\ + \sum\Gamma_{l_{3i}}P(x-l_{3i}) + D_3x + D_2 \tag{5.6}$$

$$EI\frac{dy}{dx} = -\frac{a_0x^3}{3!} - \frac{2a_1}{L}\frac{\left(x-\frac{L}{2}\right)^4}{4!} - \frac{8a_2}{L^2}\frac{\left(x-\frac{L}{2}\right)^5}{5!} - \frac{48a_3}{L^3}\frac{\left(x-\frac{L}{2}\right)^6}{6!} + \\ + \sum\Gamma_{l_{Bi}}\int_{l_{Bi}}^{x} f(z)\frac{(x-z)^2}{2!}dz - \sum\Gamma_{l_{ki}}\int_{l_{ki}}^{x} f(z)\frac{(x-z)^2}{2!}dz + \sum\Gamma_{2i}M_i(x-l_{2i}) + \\ + \sum\Gamma_{l_{3i}}P\frac{(x-l_{3i})^2}{2!} + D_3\frac{x^2}{2!} + D_2x + D_1 \tag{5.7}$$

$$EIy = -\frac{a_0x^4}{4!} - \frac{2a_1}{L}\cdot\frac{\left(x-\frac{L}{2}\right)^5}{5!} - \frac{8a_2}{L^2}\cdot\frac{\left(x-\frac{L}{2}\right)^6}{6!} - \frac{48a_3}{L^3}\cdot\frac{\left(x-\frac{L}{2}\right)^7}{7!} + \\ + \sum\Gamma_{l_{Bi}}\int_{l_{Bi}}^{x} f(z)\frac{(x-z)^3}{3!}dz - \sum\Gamma_{l_{ki}}\int_{l_{ki}}^{x} f(z)\frac{(x-z)^3}{3!}dz + \sum\Gamma_{l_{2i}}M_i\frac{(x-l_{2i})^2}{2!} + \\ + \sum\Gamma_{l_{3i}}P_i\frac{(x-l_{3i})^3}{3!} + D_3\frac{x^3}{3!} + D_2\frac{x^2}{2!} + D_1X + D_0 \tag{5.8}$$

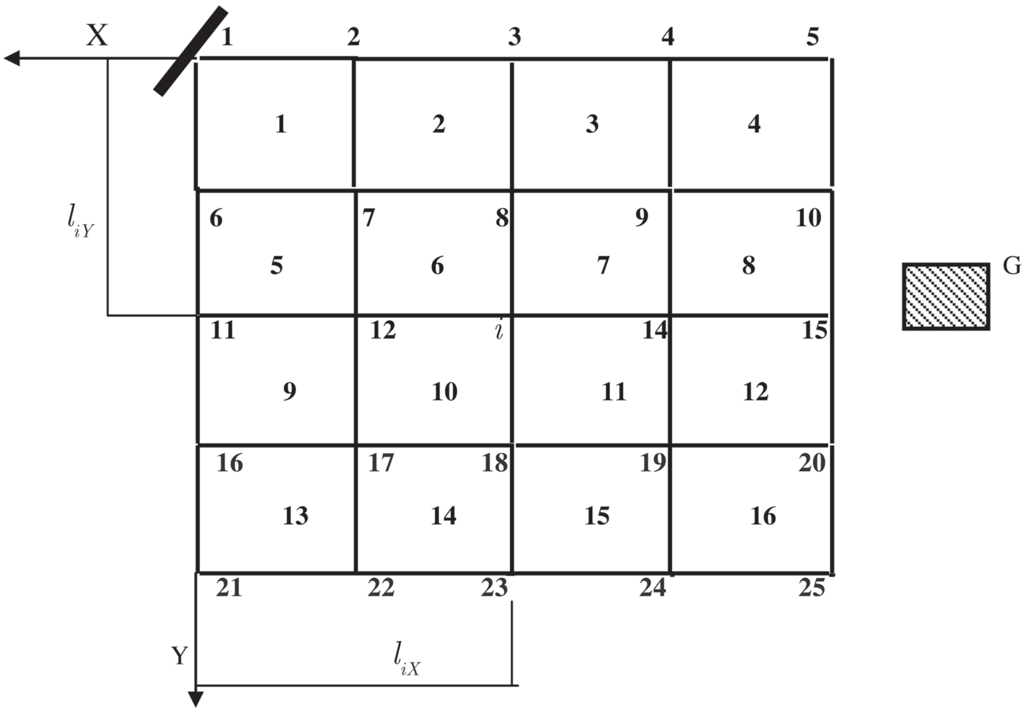

Figure 8.6 The mat with fictitious restraints at node 1

as uniformly distributed loads. All tributary areas of these loads have a rectangular shape. For example, the tributary area of the load at point 8 is equal to $\frac{1}{4}(A_2 + A_3 + A_6 + A_7)$, the tributary area of the load at point 3 is equal to $\frac{1}{4}(A_2 + A_3)$, and so on.

5. Now, the given system soil-plate is divided into two parts: the plate with the given loads and unknown soil reactions, and the soil loaded with a series of unknown uniformly distributed loads.

The soil has loads located outside of the plate area (loads G). Now, each part of the system can be investigated separately. The vertical linear deflection of the plate at any node i can be found from the following equation:

$$\Delta_i' = \Delta_{i2}X_2 + \ldots + \Delta_{i24}X_{24} + \Delta_{i25}X_{25} + \Delta_{iP} \tag{8.15}$$

$\Delta_{i1}X_1$ is not included in this equation because the plate at node 1 is restrained against any deflections including settlements. In this equation, Δ_{ik} is the vertical deflection of the plate at point i due to one unit load applied to the plate at point k, and Δ_{iP} is the vertical deflection of the plate at the same point i due to the given loads applied to the plate. However, formula 8.15 does not take into account that restraints applied at point 1 are fictitious and, in reality, do not exist. The plate at node 1 will experience one vertical deflection Δ_1 and two rotations, φ_{1X} and φ_{1Y}, that will produce additional