3 Calculate the x and y components of the acceleration of the CGs of all moving links in the global coordinate system (GCS):

$$\begin{aligned}
\mathbf{a}_{G_2} &= 47.722@\angle -86.34°; & a_{G_{2x}} &= 3.048, & a_{G_{2y}} &= -47.625 \\
\mathbf{a}_{G_3} &= 92.602@\angle 226.55°; & a_{G_{3x}} &= -63.680, & a_{G_{3y}} &= -67.231 \\
\mathbf{a}_{G_4} &= 36.004@\angle 207.24°; & a_{G_{4x}} &= -31.988, & a_{G_{4y}} &= -16.524
\end{aligned} \qquad (e)$$

4 Calculate the x and y components of the external force at P in the GCS:

$$\mathbf{F}_{P3} = 355.86 \ @ \ \angle 330°; \qquad F_{P3_x} = 308.184, \qquad F_{P3_y} = -177.930 \qquad (f)$$

5 Substitute these given and calculated values into the matrix equation 11.9 (p. 587).

$$\begin{bmatrix}
1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0.0762 & 0 & -0.0338 & 0.0635 & 0 & 0 & 0 & 0 & 1 \\
0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & -0.2087 & 0.0933 & 0.0727 & 0.2626 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & -1 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & -1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0.1230 & 0.0318 & 0.1230 & 0.0318 & 0
\end{bmatrix} \times \begin{bmatrix} F_{12_x} \\ F_{12_y} \\ F_{32_x} \\ F_{32_y} \\ F_{43_x} \\ F_{43_y} \\ F_{14_x} \\ F_{14_y} \\ T_{12} \end{bmatrix} =$$

$$\begin{bmatrix}
0.680(3.048) \\
0.680(-47.625) \\
0.006(-40) \\
3.493(-63.680) - 308.184 \\
3.493(-67.231) - (-177.930) \\
0.011(120.609) - \left[-0.0392(-177.930)\right] \ 0.0654(308.184) \\
2.631(-31.988) \\
2.631(-16.524) \\
0.090(276.423) - 13.558
\end{bmatrix} = \begin{bmatrix} 2.073 \\ -32.385 \\ -2.400 \\ -530.618 \\ -56.908 \\ 14.507 \\ -84.160 \\ -43.475 \\ 11.320 \end{bmatrix} \qquad (g)$$

6 Solve this system either by inverting matrix **A** and premultiplying that inverse times matrix **C** using a pocket calculator with matrix capability, or by inputting the values for matrices **A** and **C** to program MATRIX provided with this text, which gives the following solution:

$$\begin{bmatrix} F_{12_x} \\ F_{12_y} \\ F_{32_x} \\ F_{32_y} \\ F_{43_x} \\ F_{43_y} \\ F_{14_x} \\ F_{14_y} \\ T_{12} \end{bmatrix} = \begin{bmatrix} -534.58 \\ -428.55 \\ 536.65 \\ 396.16 \\ 6.03 \\ 339.25 \\ -78.13 \\ 295.78 \\ 33.47 \end{bmatrix} \qquad (h)$$

11