$E := 210000$ $\quad$ $G := 81000$

$b := 100$ $\quad$ $h := 100$

$A := b \cdot h$ $\quad$ $ks := 1{,}2$

$L := 5000$ $\quad$ $I := \dfrac{b \cdot h^{3}}{12}$ $\quad$ $nEl := 10$ $\quad$ $nEdof := 6$

$nNodes := nEl + 1 = 11$

$ll := \dfrac{L}{nEl} = 500$

$qx := 0$

$qy := -1$

$Ke(x1 ; y1 ; x2 ; y2 ; b ; h ; E ; G) :=$

$$A := b \cdot h$$

$$b0 := x2 - x1$$

$$b1 := y2 - y1$$

$$I := \frac{b \cdot h^{3}}{12}$$

$$ks := 1{,}2$$

$$L := \sqrt{b0^{2} + b1^{2}}$$

$$m := \frac{12 \cdot E \cdot I}{G \cdot A \cdot L^{2}} \cdot ks$$

$$n0 := \frac{b0}{L}$$

$$n1 := \frac{b1}{L}$$

$$K1 := \begin{bmatrix} \frac{A \cdot E}{L} & 0 & 0 & \frac{(-A) \cdot E}{L} & 0 & \cdots \\ 0 & \frac{12 \cdot E \cdot I}{(1+m) \cdot L^{3}} & \frac{6 \cdot E \cdot I}{(1+m) \cdot L^{2}} & 0 & \frac{(-12) \cdot E \cdot I}{(1+m) \cdot L^{3}} & \frac{6 \cdots}{(1 - \cdots} \\ 0 & \frac{6 \cdot E \cdot I}{(1+m) \cdot L^{2}} & \frac{4 \cdot E \cdot I}{(1+m) \cdot L} \cdot \left(1 + \frac{m}{4}\right) & 0 & \frac{(-6) \cdot E \cdot I}{(1+m) \cdot L^{2}} & \frac{2 \cdot E \cdot \cdots}{(1+m) \cdots} \\ \frac{(-A) \cdot E}{L} & 0 & 0 & \frac{A \cdot E}{L} & 0 & \cdots \\ 0 & \frac{(-12) \cdot E \cdot I}{(1+m) \cdot L^{3}} & \frac{(-6) \cdot E \cdot I}{(1+m) \cdot L^{2}} & 0 & \frac{12 \cdot E \cdot I}{(1+m) \cdot L^{3}} & \frac{(- \cdots}{(1 - \cdots} \\ 0 & \frac{6 \cdot E \cdot I}{(1+m) \cdot L^{2}} & \frac{2 \cdot E \cdot I}{(1+m) \cdot L} \cdot \left(1 - \frac{m}{2}\right) & 0 & \frac{(-6) \cdot E \cdot I}{(1+m) \cdot L^{2}} & \frac{4 \cdot E \cdot \cdots}{(1+m) \cdots} \end{bmatrix}$$

$$GG := \begin{bmatrix} n0 & -n1 & 0 & 0 & 0 & 0 \\ n1 & n0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & n0 & -n1 & 0 \\ 0 & 0 & 0 & n1 & n0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$K1 := \left(GG^{\mathrm{T}} \cdot K1\right)$$

$$fle(x1; y1; x2; y2; qx; qy) := \left| \begin{array}{l} b0 := x2 - x1 \\ b1 := y2 - y1 \\ L := \sqrt{b0^2 + b1^2} \\ f := \begin{bmatrix} \frac{L \cdot qx}{2} \\ \frac{L \cdot qy}{2} \\ \frac{qy \cdot L^2}{12} \\ \frac{L \cdot qx}{2} \\ \frac{L \cdot qy}{2} \\ -\frac{qy \cdot L^2}{12} \end{bmatrix} \\ f \end{array} \right.$$

$$Nodes := \text{matrix}(nNodes; 2)$$

$$\text{for } i \in [1..nNodes]$$
$$\quad Nodes_{i\,1} := (i - 1) \cdot l1$$

$$Nodes = \begin{bmatrix} 0 & 0 \\ 500 & 0 \\ 1000 & 0 \\ 1500 & 0 \\ 2000 & 0 \\ 2500 & 0 \\ 3000 & 0 \\ 3500 & 0 \\ 4000 & 0 \\ 4500 & 0 \\ 5000 & 0 \end{bmatrix}$$

$$edof := \mathrm{matrix}\left(nEl ; 6\right) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

for $\mathrm{i} \in \left[1..nEl\right]$
  for $j \in \left[1..6\right]$
    $edof_{\mathrm{i}\, j} := \left(\mathrm{i} - 1\right) \cdot 3 + j$

$$edof = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 & 8 & 9 \\ 7 & 8 & 9 & 10 & 11 & 12 \\ 10 & 11 & 12 & 13 & 14 & 15 \\ 13 & 14 & 15 & 16 & 17 & 18 \\ 16 & 17 & 18 & 19 & 20 & 21 \\ 19 & 20 & 21 & 22 & 23 & 24 \\ 22 & 23 & 24 & 25 & 26 & 27 \\ 25 & 26 & 27 & 28 & 29 & 30 \\ 28 & 29 & 30 & 31 & 32 & 33 \end{bmatrix}$$

$nDof := edof_{nEl\,6} = 33$

$$assemk(KK; K; edofe) := \left| \begin{array}{l} \text{for } i \in [1..nEdof] \\ \quad \text{for } j \in [1..nEdof] \\ \quad\quad KK_{edofe_i\, edofe_j} := KK_{edofe_i\, edofe_j} + K_{i\,j} \\ KK \end{array} \right.$$

$$assemf(fl; fle; edofe) := \left| \begin{array}{l} \text{for } i \in [1..nEdof] \\ \quad fl_{edofe_i} := fl_{edofe_i} + fle_i \\ fl \end{array} \right.$$

$$genK := \left| \begin{array}{l} K := \text{matrix}(nDof; nDof) \\ \text{for } i \in [1..nEl] \\ \quad \left| \begin{array}{l} KKe := Ke\left(Nodes_{i\,1}; Nodes_{i\,2}; Nodes_{i+1\,1}; Nodes_{i+1\,2}; b; h; E; G\right) \\ edofe := edof_{[i..i][1..6]} \\ K := assemk(K; KKe; edofe) \end{array} \right. \\ K \end{array} \right.$$

$$genK=\begin{bmatrix}
4{,}2\cdot 10^{6} & 0 & 0 & -4{,}2\cdot 10^{6} & 0 & 0 & 0 & 0 \\
0 & 1{,}4941\cdot 10^{5} & 3{,}7352\cdot 10^{7} & 0 & -1{,}4941\cdot 10^{5} & 3{,}7352\cdot 10^{7} & 0 & 0 \\
0 & 3{,}7352\cdot 10^{7} & 1{,}2838\cdot 10^{10} & 0 & -3{,}7352\cdot 10^{7} & 5{,}8379\cdot 10^{9} & 0 & 0 \\
-4{,}2\cdot 10^{6} & 0 & 0 & 8{,}4\cdot 10^{6} & 0 & 0 & -4{,}2\cdot 10^{6} & 0 \\
0 & -1{,}4941\cdot 10^{5} & -3{,}7352\cdot 10^{7} & 0 & 2{,}9881\cdot 10^{5} & 0 & 0 & -1{,}4941\cdot 10 \\
0 & 3{,}7352\cdot 10^{7} & 5{,}8379\cdot 10^{9} & 0 & 0 & 2{,}5676\cdot 10^{10} & 0 & -3{,}7352\cdot 10 \\
0 & 0 & 0 & -4{,}2\cdot 10^{6} & 0 & 0 & 8{,}4\cdot 10^{6} & 0 \\
0 & 0 & 0 & 0 & -1{,}4941\cdot 10^{5} & -3{,}7352\cdot 10^{7} & 0 & 2{,}9881\cdot 10^{5} \\
0 & 0 & 0 & 0 & 3{,}7352\cdot 10^{7} & 5{,}8379\cdot 10^{9} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & -4{,}2\cdot 10^{6} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & -1{,}4941\cdot 10 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 3{,}7352\cdot 10^{7} \\
 & & & & & & \vdots &
\end{bmatrix}$$

```
kmax := | km := 0
        | for i ∈ [1..nDof]
        |   if km < genK[i i]
        |     km := genK[i i]
        |   else
        |     km := km
        | km
```

$c := kmax \cdot 1000000 = 2{,}5676 \cdot 10^{16}$

$bc := \text{matrix}(nDof; 2)$

```
for i ∈ [1..nDof]
  bc[i 1] := i
```

Boundary condition: $bc_{1\,2} := 1$ $bc_{2\,2} := 1$ $bc_{nDof-1\,2} := 1$

$Kbc := genK$

```
| for i ∈ [1..nDof]
|   if bc[i 2] = 1
|     Kbc[i i] := Kbc[i i] + c
|   else
|     continue
| Kbc
```

$$Kbc = \begin{bmatrix}
2{,}5676\cdot10^{16} & 0 & 0 & -4{,}2\cdot10^{6} & 0 & 0 & 0 & 0 \\
0 & 2{,}5676\cdot10^{16} & 3{,}7352\cdot10^{7} & 0 & -1{,}4941\cdot10^{5} & 3{,}7352\cdot10^{7} & 0 & 0 \\
0 & 3{,}7352\cdot10^{7} & 1{,}2838\cdot10^{10} & 0 & -3{,}7352\cdot10^{7} & 5{,}8379\cdot10^{9} & 0 & 0 \\
-4{,}2\cdot10^{6} & 0 & 0 & 8{,}4\cdot10^{6} & 0 & 0 & -4{,}2\cdot10^{6} & 0 \\
0 & -1{,}4941\cdot10^{5} & -3{,}7352\cdot10^{7} & 0 & 2{,}9881\cdot10^{5} & 0 & 0 & -1{,}4941\cdot1 \\
0 & 3{,}7352\cdot10^{7} & 5{,}8379\cdot10^{9} & 0 & 0 & 2{,}5676\cdot10^{10} & 0 & -3{,}7352\cdot1 \\
0 & 0 & 0 & -4{,}2\cdot10^{6} & 0 & 0 & 8{,}4\cdot10^{6} & 0 \\
0 & 0 & 0 & 0 & -1{,}4941\cdot10^{5} & -3{,}7352\cdot10^{7} & 0 & 2{,}9881\cdot10 \\
0 & 0 & 0 & 0 & 3{,}7352\cdot10^{7} & 5{,}8379\cdot10^{9} & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & -4{,}2\cdot10^{6} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & -1{,}4941\cdot1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 3{,}7352\cdot10 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & & & & \vdots
\end{bmatrix}$$

Loads:

```
genFl := | fl := matrix(nDof; 1)
         | for  i ∈ [1..nEl]
         |   | fle := fle(Nodes[i 1]; Nodes[i 2]; Nodes[i+1 1]; Nodes[i+1 2]; qx; qy)
         |   | edofe := edof[[i..i][1..6]]
         |   | fl := assemf(fl; fle; edofe)
         | fl
```

$$genFl = \begin{bmatrix} 0 \\ -250 \\ -20833{,}3333 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -500 \\ 0 \\ 0 \\ -250 \\ 20833{,}3333 \end{bmatrix}$$

$f := genFl$

$$u := \text{invert}\left(Kbc\right) \cdot f = \begin{bmatrix} 0 \\ -9{,}7368 \cdot 10^{-14} \\ -0{,}003 \\ 0 \\ -1{,}4615 \\ -0{,}0028 \\ 0 \\ -2{,}7649 \\ -0{,}0024 \\ 0 \\ -3{,}7851 \\ -0{,}0017 \\ 0 \\ -4{,}433 \\ -0{,}0009 \\ 0 \\ -4{,}6549 \\ -5{,}5436 \cdot 10^{-17} \\ 0 \\ -4{,}433 \\ 0{,}0009 \\ 0 \\ -3{,}7851 \\ 0{,}0017 \\ 0 \\ -2{,}7649 \\ 0{,}0024 \\ 0 \\ -1{,}4615 \\ 0{,}0028 \\ 0 \\ -9{,}7368 \cdot 10^{-14} \\ 0{,}003 \end{bmatrix}$$

$$R := \left( genK \cdot u - f \right) = \begin{bmatrix} 0 \\ 2500 \\ -1{,}4301 \cdot 10^{-7} \\ 0 \\ 2{,}6882 \cdot 10^{-9} \\ 1{,}0466 \cdot 10^{-6} \\ 0 \\ -3{,}4395 \cdot 10^{-9} \\ -9{,}4174 \cdot 10^{-8} \\ 0 \\ 3{,}2008 \cdot 10^{-9} \\ 1{,}3808 \cdot 10^{-7} \\ 0 \\ -5{,}6374 \cdot 10^{-9} \\ -4{,}2519 \cdot 10^{-7} \\ 0 \\ 8{,}2668 \cdot 10^{-9} \\ 2{,}5887 \cdot 10^{-7} \\ 0 \\ -3{,}8941 \cdot 10^{-9} \\ 1{,}224 \cdot 10^{-6} \\ 0 \\ -5{,}1187 \cdot 10^{-10} \\ 3{,}6975 \cdot 10^{-7} \\ 0 \\ -1{,}7754 \cdot 10^{-9} \\ -1{,}7427 \cdot 10^{-7} \\ 0 \\ 1{,}5907 \cdot 10^{-9} \\ -2{,}7945 \cdot 10^{-7} \\ 0 \\ 2500 \\ 9{,}4835 \cdot 10^{-8} \end{bmatrix}$$

$EI := E \cdot I = 1,75 \cdot 10^{12}$ $\quad GAK := G \cdot A \cdot ks = 9,72 \cdot 10^{8}$

$\alpha := \dfrac{EI}{GAK} = 1800,4115$

$$C := \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 6 \cdot \alpha & 0 & 0 & 1 & 0 \\ L & 0 & 0 & 1 & 0 & 0 \\ 0 & L^{3} & L^{2} & 0 & L & 1 \\ 0 & 3 \cdot \left(L^{2} + 2 \cdot \alpha\right) & 2 \cdot L & 0 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 10802,4691 & 0 & 0 & 1 & 0 \\ 5000 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1,25 \cdot 10^{11} & 2,5 \cdot 10^{7} & 0 & 5000 & 1 \\ 0 & 7,5011 \cdot 10^{7} & 10000 & 0 & 1 & 0 \end{bmatrix}$$

$$invC := \mathrm{invert}\left(C\right) = \begin{bmatrix} -0,0002 & 0 & 0 & 0,0002 & 0 & \\ 0 & 1,5986 \cdot 10^{-11} & 3,9965 \cdot 10^{-8} & 0 & -1,5986 \cdot 10^{-11} & \\ 0 & -1,199 \cdot 10^{-7} & -0,0004 & 0 & 1,199 \cdot 10^{-7} & \cdots \\ 1 & 0 & 0 & 0 & 0 & \\ 0 & -1,7269 \cdot 10^{-7} & 0,9996 & 0 & 1,7269 \cdot 10^{-7} & \\ 0 & 1 & 0 & 0 & 0 & \end{bmatrix}$$

$$ed := \mathrm{matrix}\left(nEl \, ; \, 6\right) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

```
for  i ∈ [1..nEl]
  for  j ∈ [1..6]
    ed   := u
      i j    edof
                 i j
```

$$ed = \begin{bmatrix} 0 & -9,7368 \cdot 10^{-14} & -0,003 & 0 & -1,4615 & -0,0028 \\ 0 & -1,4615 & -0,0028 & 0 & -2,7649 & -0,0024 \\ 0 & -2,7649 & -0,0024 & 0 & -3,7851 & -0,0017 \\ 0 & -3,7851 & -0,0017 & 0 & -4,433 & -0,0009 \\ 0 & -4,433 & -0,0009 & 0 & -4,6549 & -5,5436 \cdot 10^{-17} \\ 0 & -4,6549 & -5,5436 \cdot 10^{-17} & 0 & -4,433 & 0,0009 \\ 0 & -4,433 & 0,0009 & 0 & -3,7851 & 0,0017 \\ 0 & -3,7851 & 0,0017 & 0 & -2,7649 & 0,0024 \\ 0 & -2,7649 & 0,0024 & 0 & -1,4615 & 0,0028 \\ 0 & -1,4615 & 0,0028 & 0 & -9,7368 \cdot 10^{-14} & 0,003 \end{bmatrix}$$

$$m(Nodes; b; h; E; G; ed) := \left| \begin{array}{l} A := b \cdot h \\ b0 := \mathrm{matrix}(1; nEl) \\ b1 := \mathrm{matrix}(1; nEl) \\ \text{for } \mathrm{i} \in [1..nEl] \\ \quad \left| \begin{array}{l} L := \sqrt{\left(Nodes_{\mathrm{i}+1\,1} - Nodes_{\mathrm{i}\,1}\right)^2 + \left(Nodes_{\mathrm{i}+1\,2} - Nodes_{\mathrm{i}\,2}\right)^2} \\ n0_{\mathrm{i}} := \dfrac{Nodes_{\mathrm{i}+1\,1} - Nodes_{\mathrm{i}\,1}}{L} \\ n1_{\mathrm{i}} := \dfrac{Nodes_{\mathrm{i}+1\,2} - Nodes_{\mathrm{i}\,2}}{L} \end{array} \right. \\ m := \mathrm{matrix}(1; nEl) \\ \text{for } \mathrm{i} \in [1..nEl] \\ \quad \left| \; m_{\mathrm{i}} := \begin{bmatrix} n0_{\mathrm{i}} & -n1_{\mathrm{i}} & 0 & 0 & 0 & 0 \\ n1_{\mathrm{i}} & n0_{\mathrm{i}} & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & n0_{\mathrm{i}} & -n1_{\mathrm{i}} & 0 \\ 0 & 0 & 0 & n1_{\mathrm{i}} & n0_{\mathrm{i}} & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \cdot \mathrm{submatrix}(ed; \mathrm{i}; \mathrm{i}; 1; 6)^{\mathrm{T}} \right. \\ m \end{array} \right.$$

$$m := m\left(Nodes\,;\,b\,;\,h\,;\,E\,;\,G\,;\,ed\right) = \left[\begin{bmatrix} 0 \\ -9{,}7368 \cdot 10^{-14} \\ -0{,}003 \\ 0 \\ -1{,}4615 \\ -0{,}0028 \end{bmatrix} \begin{bmatrix} 0 \\ -1{,}4615 \\ -0{,}0028 \\ 0 \\ -2{,}7649 \\ -0{,}0024 \end{bmatrix} \begin{bmatrix} 0 \\ -2{,}7649 \\ -0{,}0024 \\ 0 \\ -3{,}7851 \\ -0{,}0017 \end{bmatrix} \begin{bmatrix} 0 \\ -3{,}7851 \\ -0{,}0017 \\ 0 \\ -4{,}433 \\ -0{,}0009 \end{bmatrix} \begin{bmatrix} 0 \\ -4{,}433 \\ -0{,}0009 \\ 0 \\ -4{,}6549 \\ -5{,}5436 \cdot 10^{-17} \end{bmatrix} \cdots \right]$$

$M1 := \mathrm{matrix}(nEl; 1)$
$M2 := \mathrm{matrix}(nEl; 1)$
$V1 := \mathrm{matrix}(nEl; 1)$
$V2 := \mathrm{matrix}(nEl; 1)$
for $i \in [1..nEl]$

$L := \sqrt{\left(Nodes_{i+1\,1} - Nodes_{i\,1}\right)^2 + \left(Nodes_{i+1\,2} - Nodes_{i\,2}\right)^2}$

$co := \frac{12}{L^2} \cdot \frac{ks \cdot E \cdot I}{G \cdot A}$

$u1 := m_{1\,i\,1}$

$u2 := m_{1\,i\,4}$

$v1 := m_{1\,i\,2}$

$t1 := m_{1\,i\,3}$

$v2 := m_{1\,i\,5}$

$t2 := m_{1\,i\,6}$

$fle := fle\left(Nodes_{i\,1}; Nodes_{i\,2}; Nodes_{i+1\,1}; Nodes_{i+1\,2}; qx; qy\right)$

$M1_i := \left(-\left(\left(\frac{1}{1+co}\right) \cdot \left(\frac{6 \cdot E \cdot I}{L^2}\right) \cdot v1 + \left(\frac{E}{1+co} \cdot 4 \cdot \frac{I}{L} \cdot \left(1 + \frac{co}{4}\right)\right) \cdot t1 + \left(-\frac{E}{1+co}\right) \cdot 6 \cdot \frac{I}{L^2} \cdot v2 + \left(\left(\frac{E}{1+co}\right) \cdot 2 \cdot \frac{I}{L} \cdot \left(1 -\right.\right.\right.\right.$

$M2_i := \left(\frac{1}{1+co}\right) \cdot \left(\frac{6 \cdot E \cdot I}{L^2}\right) \cdot v1 + \left(\frac{E}{1+co} \cdot 2 \cdot \frac{I}{L} \cdot \left(1 - \frac{co}{2}\right)\right) \cdot t1 + \left(\frac{-E}{1+co}\right) \cdot 6 \cdot \frac{I}{L^2} \cdot v2 + \left(\left(\frac{E}{1+co}\right) \cdot 4 \cdot \frac{I}{L} \cdot \left(1 + \frac{co}{4}\right)\right)$

$V1_i := \left(\frac{1}{1+co}\right) \cdot \left(\frac{12 \cdot E \cdot I}{L^3}\right) \cdot v1 + \left(\frac{E}{1+co} \cdot 6 \cdot \frac{I}{L^2}\right) \cdot t1 + \left(-\frac{E}{1+co}\right) \cdot 12 \cdot \frac{I}{L^3} \cdot v2 + \left(\left(\frac{E}{1+co}\right) \cdot 6 \cdot \frac{I}{L^2}\right) \cdot t2 - fle_2$

$V2_i := -\left(\left(\frac{-1}{1+co}\right) \cdot \left(\frac{12 \cdot E \cdot I}{L^3}\right) \cdot v1 + \left(\frac{-E}{1+co} \cdot 6 \cdot \frac{I}{L^2}\right) \cdot t1 + \left(\frac{E}{1+co}\right) \cdot 12 \cdot \frac{I}{L^3} \cdot v2 + \left(\left(\frac{-E}{1+co}\right) \cdot 6 \cdot \frac{I}{L^2}\right) \cdot t2 - fle_5\right.$

$$M1 = \begin{bmatrix} 3{,}7575 \cdot 10^{-7} \\ 1{,}125 \cdot 10^{6} \\ 2 \cdot 10^{6} \\ 2{,}625 \cdot 10^{6} \\ 3 \cdot 10^{6} \\ 3{,}125 \cdot 10^{6} \\ 3 \cdot 10^{6} \\ 2{,}625 \cdot 10^{6} \\ 2 \cdot 10^{6} \\ 1{,}125 \cdot 10^{6} \end{bmatrix} \qquad M2 = \begin{bmatrix} 1{,}125 \cdot 10^{6} \\ 2 \cdot 10^{6} \\ 2{,}625 \cdot 10^{6} \\ 3 \cdot 10^{6} \\ 3{,}125 \cdot 10^{6} \\ 3 \cdot 10^{6} \\ 2{,}625 \cdot 10^{6} \\ 2 \cdot 10^{6} \\ 1{,}125 \cdot 10^{6} \\ 2{,}7927 \cdot 10^{-7} \end{bmatrix} \qquad V1 = \begin{bmatrix} 2500 \\ 2000 \\ 1500 \\ 1000 \\ 500 \\ 1{,}2711 \cdot 10^{-9} \\ -500 \\ -1000 \\ -1500 \\ -2000 \end{bmatrix} \qquad V2 = \begin{bmatrix} 2000 \\ 1500 \\ 1000 \\ 500 \\ -8{,}1346 \cdot 10^{-10} \\ -500 \\ -1000 \\ -1500 \\ -2000 \\ -2500 \end{bmatrix}$$