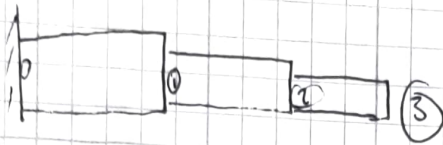


ME 366

HW 14

Will Ruzica



Assume:

0 is non-movable

Node 1:



$$k_A x_1 \quad k_B x_2 - x_1$$

$$\begin{array}{c} k_A x_1 \quad k_B x_2 \\ \leftarrow 1 \quad \leftarrow \\ x_1 \quad \rightarrow k_C x_2 \end{array}$$

$$k_A x_1 = k_B x_2 - k_C x_1$$

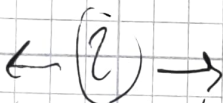
$$(k_A + k_C) x_1 - k_B x_2 = 0$$

$$k_A = \frac{10.8 (36(1) - \frac{7}{12})}{7} = 46.29 \times 10^6$$

$$k_B = \frac{10.8 (36(1) - \frac{14}{12})}{14} = 16.514 \times 10^6$$

$$k_C = \frac{10.8 (36(1) - \frac{24}{12})}{21} = 10.757 \times 10^6$$

Node 2:



$$k_B x_1 \quad k_C (x_3 - x_2)$$

$$\begin{array}{c} k_B x_1 \quad \rightarrow x \\ \leftarrow 2 \quad \leftarrow k_C x_2 \\ x_2 \quad \rightarrow k_C x_3 \end{array}$$

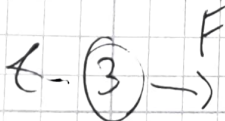
$$k_B x_1 - k_C x_2 = k_C x_3 - k_C x_2$$

$$-k_B x_1 + (k_B + k_C) x_2 - k_C x_3 = 0$$

$$\begin{bmatrix} (k_A + k_C) & -k_B & 0 \\ -k_B & (k_B + k_C) & -k_C \\ 0 & -k_C & -k_C \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1400 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0.01712 & 0.0087 & -0.0087 \\ -0.0087 & 0.0305 & -0.0305 \\ -0.0087 & -0.0305 & 0.0719 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 1400 \end{bmatrix} \times 10^6$$

Node 3:



$$k_C x_3 - x_2$$

$$-k_C x_2 + k_C x_3 = F$$

$$\begin{array}{c} k_C x_2 \\ \rightarrow 3 \quad x \\ k_C x_3 \\ \leftarrow 3 \quad x \end{array}$$

$$\epsilon_A = +1.737$$

$$\epsilon_B = +2.642$$

$$\epsilon_C = +5.1677$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0.01712 \\ -0.0087 \\ -0.0087 \end{bmatrix} \times 10^6$$

$$\sigma_A = 13.36 \text{ ksi}$$

$$\sigma_B = 3.1235 \text{ ksi}$$

$$\sigma_C = 50.03 \text{ ksi}$$