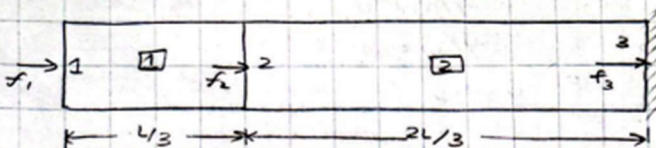


Question 3

Assignment 6 Question 3



constant Area 100mm^2
Young's Modulus 90GPa
Length 300mm
 $\delta_1 = 4\text{mm}$
 $\delta_2 = 2.5\text{mm}$
 $\delta_3 = 0\text{mm}$

$A = 1 \times 10^{-4} \text{m}^2$
 $E = 9 \times 10^9 \text{Pa}$
 $L = 0.3\text{m}$

$$d = \begin{bmatrix} 4 \\ 2.5 \\ 0 \end{bmatrix} = \begin{bmatrix} 0.004 \\ 0.0025 \\ 0 \end{bmatrix}$$

$$k_1 = \frac{3AE}{L} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \quad k_2 = \frac{3AE}{2L} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

$$k = \frac{3AE}{L} \begin{bmatrix} 1 & -1 & 0 \\ -1 & \frac{3}{2} & -\frac{1}{2} \\ 0 & -\frac{1}{2} & \frac{1}{2} \end{bmatrix} = \frac{3AE}{2L} \begin{bmatrix} 2 & -2 & 0 \\ -2 & 3 & -1 \\ 0 & -1 & 1 \end{bmatrix}$$

$$\frac{3AE}{2L} = \frac{3(1 \times 10^{-4})(9 \times 10^9)}{2(0.3)} = 4500000$$

$$f = kd$$

$$f_1 = 4500000 ((2)(0.004) + (-2)(0.0025))$$

$$f_1 = 13500 \text{ N}$$

$$f_2 = 4500000 ((-2)(0.004) + (3)(0.0025))$$

$$f_2 = -2250 \text{ N}$$

$$f_3 = 4500000 ((-1)(0.0025))$$

$$f_3 = -11250 \text{ N}$$

$$f = \begin{bmatrix} 13.5 \\ -2.25 \\ -11.25 \end{bmatrix} \text{ kN}$$