

CE 343 - Fall 2001 - Final Exam
Problem 2, Solution
RJN 12/18/01

$$\text{kN} := 1000 \cdot \text{newton}$$

Take a free-body diagram of the truss from mid span to the end.

Sum forces in the y-direction.

$$cf_y + de_y - 20 \cdot \text{kN} = 0$$

Since cf and de carry half the shear,

$$2 \cdot de_y - 20 \cdot \text{kN} = 0$$

$$de_y := 10 \cdot \text{kN}$$

From the truss dimensions:

$$de_y = \frac{4}{5} \cdot de$$

$$de := \frac{5}{4} \cdot de_y \quad de = 12.5 \text{ kN Tension}$$

$$cf := de \quad cf = 12.5 \text{ kN Compression}$$

Sum moments about e.

$$-10 \cdot \text{kN} \cdot 1.5 \cdot \text{m} - cf_x \cdot 2 \cdot \text{m} + df \cdot 2 \cdot \text{m} = 0 \quad \text{where} \quad cf_x := \frac{3}{5} \cdot cf$$

$$df := 7.5 \cdot \text{kN} + cf_x$$

$$df = 15 \text{ kN Tension}$$

Summing forces in the x-direction

$$ce := df \quad ce = 15 \text{ kN Compression}$$