

Adı ve Soyadı:

Numarası:

4-50. The three suspender bars are made of the same material and have equal cross-sectional areas A . Determine the average normal stress in each bar if the rigid beam ACE is subjected to the force P .

Equilibrium

$$\uparrow \Sigma F_y = 0$$

$$F_A + F_C + F_E - P = 0 \quad \text{--- (1)} \quad \text{1 point}$$

$$\uparrow \Sigma M_C = 0$$

$$-F_A \cdot d + P \cdot \frac{d}{2} + F_E \cdot d = 0$$

$$F_E - F_A + \frac{P}{2} = 0 \quad \text{--- (2)} \quad \text{1 point}$$

Compatibility

$$\frac{\delta_A - \delta_E}{2d} = \frac{\delta_C - \delta_E}{d}$$

$$\delta_C = \frac{\delta_A}{2} + \frac{\delta_E}{2}$$

$$\frac{F_C \cdot L}{AE} = \frac{1}{2} \left[\frac{F_A \cdot L}{AE} + \frac{F_E \cdot L}{AE} \right]$$

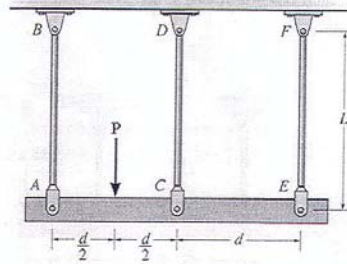
$$2 \text{ points} \quad F_C = \frac{1}{2} [F_A + F_E] \quad \text{--- (3)}$$

(3) ü (1) de yerine koyarsak

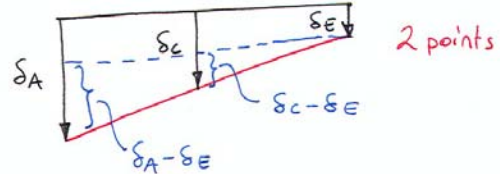
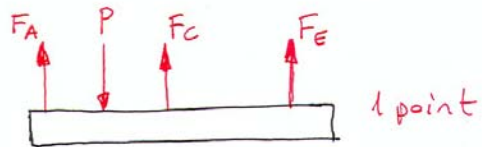
$$F_A + F_E = \frac{2}{3} P \quad \text{--- (4)}$$

(2) den F_E yi çekip (4) yerine koyarsak

$$2 \text{ points} \quad F_A = \frac{7}{12} P, \quad F_E = \frac{P}{12}, \quad F_C = \frac{P}{3}$$



Prob. 4-50



Average Normal stress
in each bar

$$\sigma_{AB} = \frac{F_A}{A} = \frac{7P}{12A}$$

$$\sigma_{CD} = \frac{F_C}{A} = \frac{P}{3A}$$

$$\sigma_{EF} = \frac{F_E}{A} = \frac{P}{12A}$$

1 point