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so many fake sites. this is the first one which worked! Many thanks

PROBLEM 2.46

The rigid bar AD is supported by two steel wires of $\frac{1}{4}$ -in. diameter (E = 29×10^6 psi) and a pin and bracket at D. Knowing that the wires were initially taut, determine (a) the additional tension in each wire when a 120-lb load P is applied at B, (b) the corresponding deflection of point B.

SOLUTION

Let δ be the rotation of bar ABCD.

Then $\delta = \theta$

$$P_B \delta = \frac{F_{AC} L_{AC}}{AE} \delta + \frac{F_{BD} L_{BD}}{AE} \delta$$

$$P_B = \frac{F_{AC} L_{AC}}{AE} + \frac{F_{BD} L_{BD}}{AE}$$

$$P_B = \frac{EA}{L_{AC}} \left(\frac{1}{3} \right)^2 (24) + \frac{EA}{L_{BD}} \left(\frac{1}{3} \right)^2 (8)$$

$$P_B = 142,353 \text{ lb}$$

$$P_B = \frac{EA}{L_{AC}} \left(\frac{1}{3} \right)^2 (8)$$

$$P_B = 88,971 \text{ lb}$$

Using free body ABCD:

$$\sum M_D = 0: 24(42,353 \text{ lb}) - 16(24) - 8(88,971 \text{ lb}) = 0$$

$$F_{AC} = 62,353 \text{ lb} \quad F_{BD} = 88,971 \text{ lb}$$

(a) $F_{AC} = 62,353 \text{ lb} \quad F_{BD} = 88,971 \text{ lb}$

(b) $\delta = 16 \text{ in} \quad \delta = 1,411 \text{ in}$

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