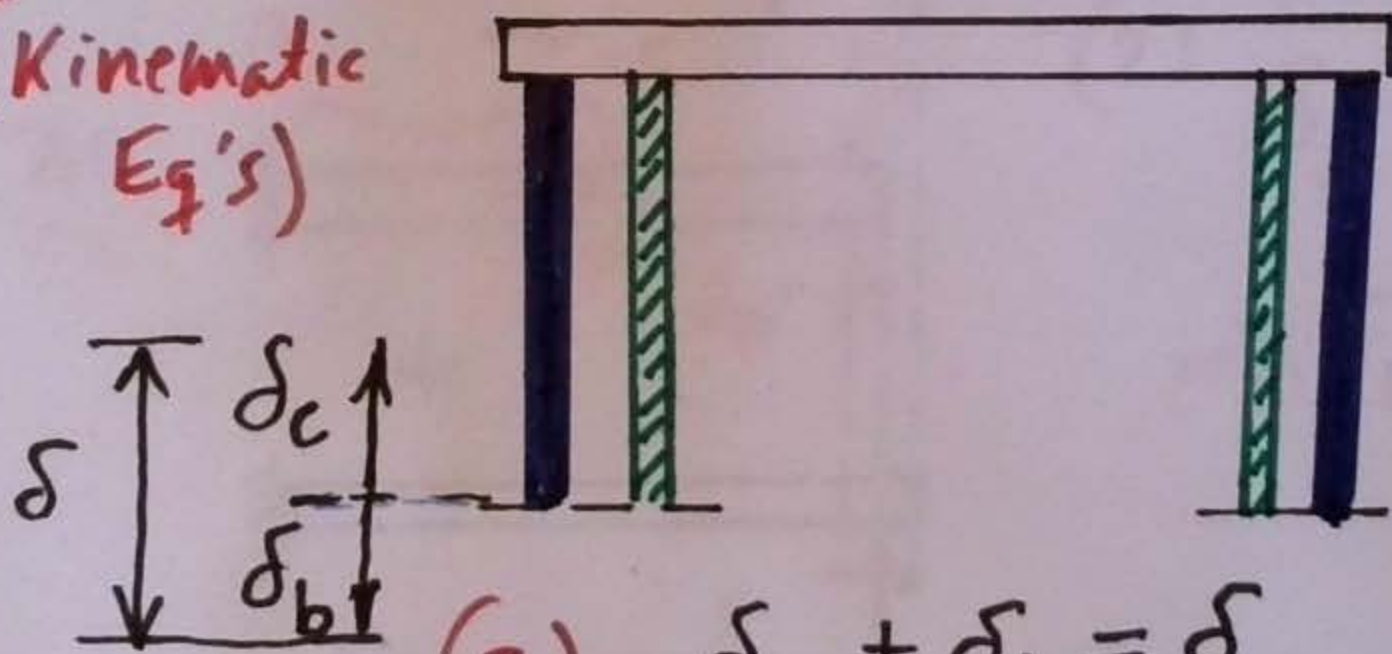


(2) Compat. eq.'s

(Kinematic Eq.'s)



5  
POINTS  
TOTAL

(2)  $\delta_c + \delta_b = \delta$

pitch  $\Rightarrow \frac{1}{20} \left[ \frac{\text{inch}}{\text{thread}} \right]$

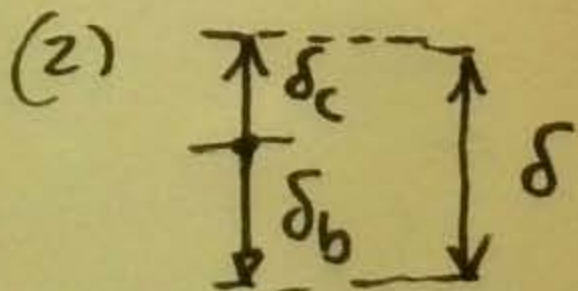
$$\frac{F_c L_c}{A_c E_c} + \frac{F_b L_b}{A_c E_b} = \delta$$

$$\Rightarrow F_c = F_c(\delta) \Rightarrow \sigma_c = \frac{F_c(\delta)}{A_c}$$

$$\Rightarrow \sigma_{allow_c} = \frac{\sigma_{yc}}{3} \Rightarrow \text{Turns}$$

$$\Rightarrow \sigma_c(\delta) = \sigma_{allow_c} \Rightarrow \delta \cdot \left( \frac{1}{20} \right)^{-1}$$

(1)  $F_c = 4F_B$



ES-2502

Exam 04-1

E04-02

Solution

Given:

2014-T6 Aluminum:

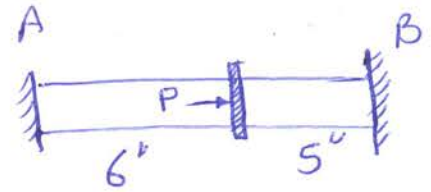
$$E = 10.6 \times 10^3 \text{ ksi}$$

$$\alpha = 12.8 \times 10^{-6}$$

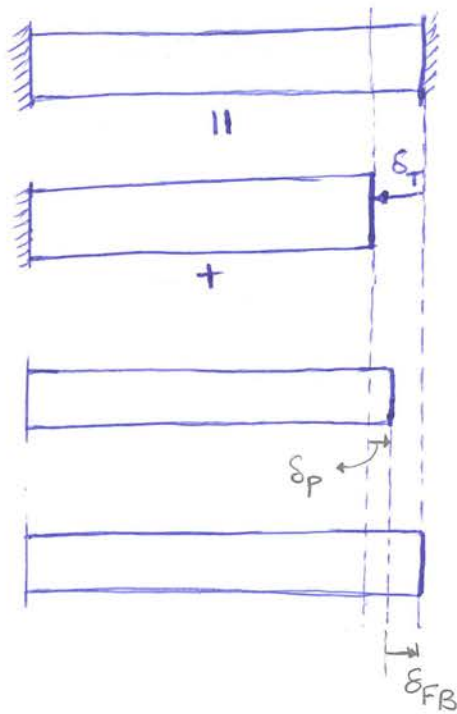
$$d = 0.5 \text{ in} \rightarrow A = \frac{\pi}{4} (0.5)^2 = 0.196 \text{ in}^2$$

$$T_1 = 70^\circ\text{F} \quad T_2 = -10^\circ\text{F}$$

$$P = 21 \text{ lb} = 0.021 \text{ kip}$$



$$\sum F_x = 0 \rightarrow 0.021 - F_A + F_B = 0 \quad (1)$$



Negative  $\oplus$   $\oplus$

$$\delta_T + \delta_P + \delta_{F_B} = 0$$

$$|\delta_T| = |\delta_F|$$

shrink  $\leftarrow$  expand  $\rightarrow$

$$(12.8 \times 10^{-6})(80)(6+5) = \frac{F_A(6)}{(0.196)(10.6 \times 10^3)} + \frac{(F_A - 0.021)5}{(0.196)(10.6 \times 10^3)}$$

$$0.011264 = 0.00288 F_A + 0.002403 F_A - 5.0462 \times 10^{-5}$$

$$F_A = 2.14 \text{ kip}$$

$$\text{From 1: } 0.021 - 2.14 + F_B = 0 \rightarrow F_B = 2.12 \text{ kip}$$

E04-02  
Solution

$$b) \quad \sigma_{AC} = \frac{F_1}{A} = \frac{F_A}{A} = \frac{2.14 \text{ kip}}{0.196} = 10.9 \text{ ksi}$$

$$\sigma_{AC} = 10.9 \text{ ksi (tension)}$$

$$\sigma_{CB} = \frac{F_2}{A} = \frac{(F_A - 0.021)}{A} = \frac{2.12}{0.196} = 10.8 \text{ ksi}$$

$$\sigma_{BC} = 10.8 \text{ ksi (tension)}$$

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$$\Sigma F_x = 0$$

~~5 points~~

Compatibility formula:

~~2 points~~

FBD: ~~10 points~~

Correct answers for  $\epsilon_T$ ,  $\delta_P$ ,  $\delta_{FB}$

**5 POINTS TOTAL**