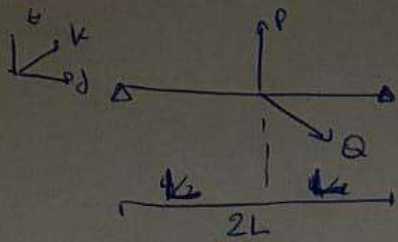
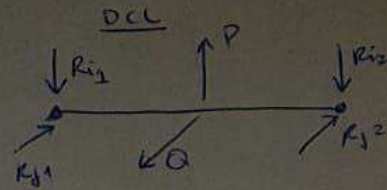


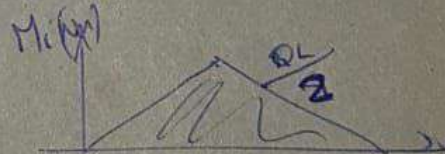
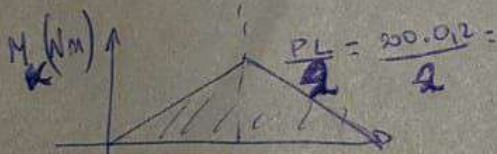
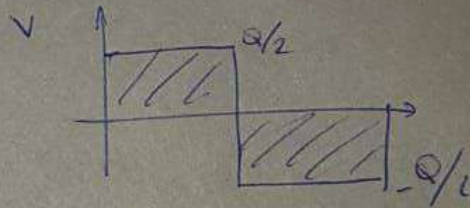
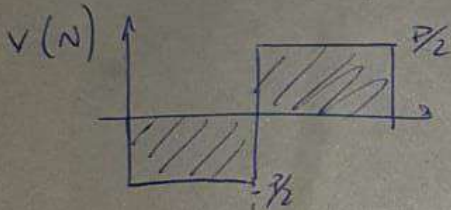
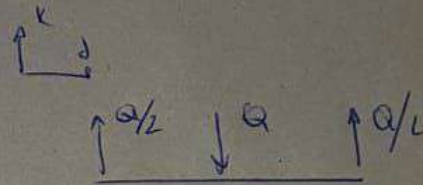
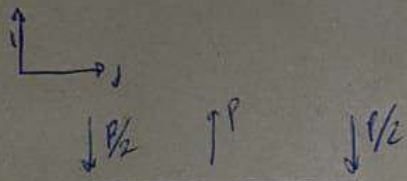
①



$P = 200 \text{ N}$
 $Q = 300 \text{ N}$
 $\phi = 0,01 \text{ rad}$



$R_{j1} = R_{j2} = \frac{Q}{2} = 150 \text{ N}$
 $R_{i1} = R_{i2} = \frac{P}{2} = 100 \text{ N}$



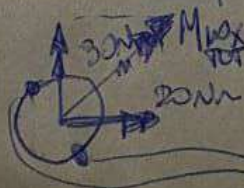
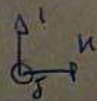
$(M_k = -M_k)$
 por el sistema alternado

$M_{k, \text{MAX}} = 50 \cdot 0,2$
 $M_{k, \text{MAX}} = 20 \text{ Nm}$

$M_{\text{MAX}} = 300 \cdot 0,2 / 2 = 30 \text{ Nm}$
 $M_{i, \text{MAX}} = 30 \text{ Nm}$

$I = \frac{\pi d^4}{64}$

ESFUERZO :

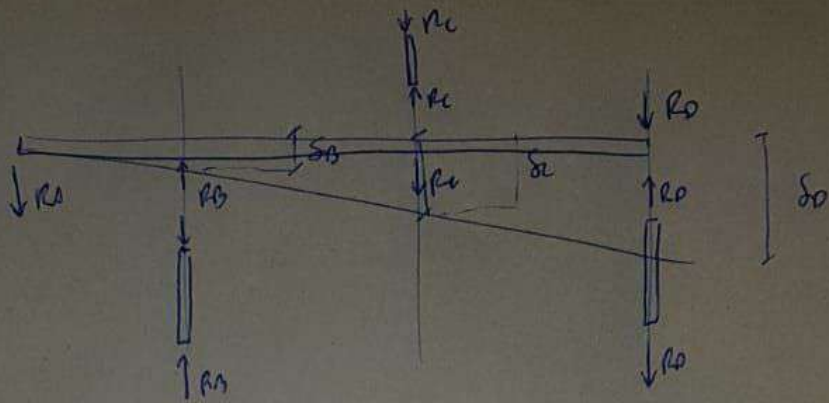


$M_{\text{MAX TOT}} = \sqrt{20^2 + 30^2} = \sqrt{1300}$
 $= 36,1 \text{ Nm}$

$\sigma_{\text{MAX}} = \frac{M_{\text{MAX}} \cdot d}{2I} = \frac{32 \text{ M}}{\pi \phi^3} = 368$

5

(2)



$$\alpha_B = \alpha_C = \alpha_D$$

$$e_B = e_C = e_D$$

EL
COLUMN

$$\left\{ \begin{aligned} -\delta_B &= \alpha \Delta T_B - R_B / EA \rightarrow R_B = (+\delta_B + \alpha \Delta T_B) EA \\ \delta_C &= \frac{\alpha \Delta T_C}{2} - \frac{R_C}{2EA} \rightarrow R_C = \left(\frac{\alpha \Delta T_C}{2} - \delta_C \right) 2EA \\ -\delta_D &= \alpha \Delta T_D + R_D / EA \rightarrow R_D = (-\delta_D - \alpha \Delta T_D) EA \end{aligned} \right.$$

COMP
BEAM

$$\left\{ \begin{aligned} \frac{\delta_B}{0.5} &= 2\delta_B = \delta_C \\ \frac{\delta_D}{1.5} &= \frac{2}{3}\delta_D = \delta_C \end{aligned} \right. \quad \left\{ \begin{aligned} \delta_D &= 3\delta_B \\ \delta_C &= 2\delta_B = \frac{2}{3}\delta_D \end{aligned} \right.$$

EST

$$\begin{aligned} \sigma_B &= R_B / A \\ \sigma_C &= R_C / A \\ \sigma_D &= R_D / A \end{aligned}$$

NEWTON
V. 68

$$\left\{ \begin{aligned} \sum M_A &= 0 \\ R_B \cdot 0.5 &= R_C + 1.5 R_D \\ R_B &= 2R_C + 3R_D \end{aligned} \right.$$

NEWTON + CONSTANT

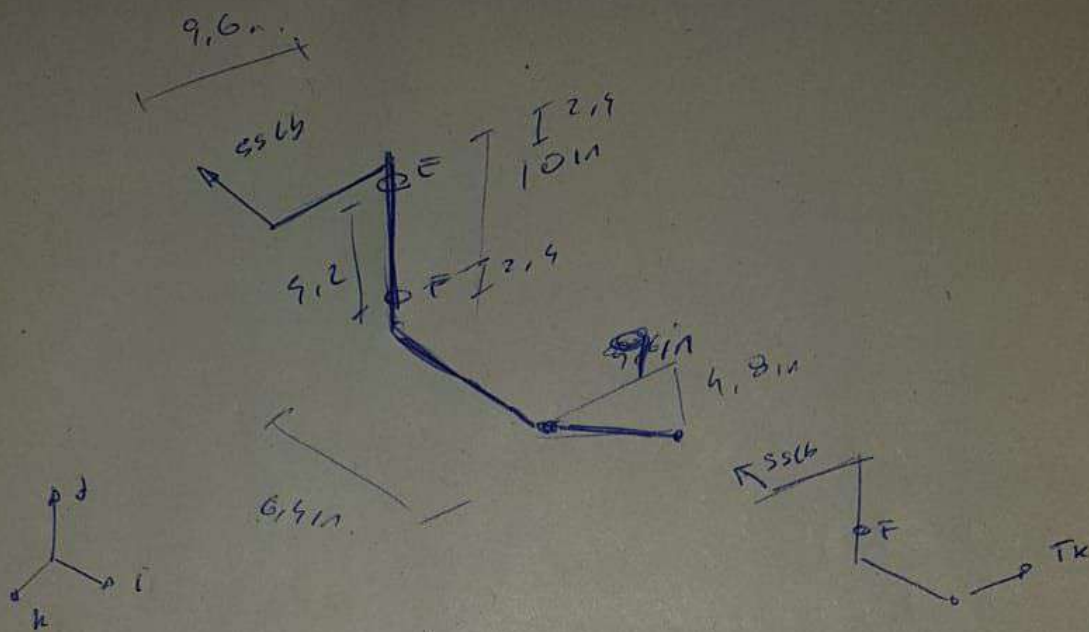
$$(\delta_B + 30\alpha) = 2(10\alpha - \delta_C) + 3(10\alpha - \delta_D)$$

$$\delta_B + 2\delta_C + 3\delta_D = 20\alpha + 30\alpha - 30\alpha$$

$$\delta_B + 4\delta_B + 9\delta_B = 20\alpha \quad \delta_B = \frac{20\alpha}{14}$$

comp
geom

$$\left\{ \begin{array}{l} \delta_B = 1,42\alpha \quad \sigma_B = (1,42\alpha + 30\alpha)E = 364 \text{ MPa} \\ \delta_C = 2,86\alpha \quad \sigma_C = (10\alpha - 2,86\alpha)E = 17,4 \text{ MPa} \\ \delta_D = 4,29\alpha \quad \sigma_D = (10\alpha - 4,29\alpha)E = 13,91 \text{ MPa} \end{array} \right.$$



$$\sum M_j = 0 \quad 55 \text{ lb} \cdot 9.6 \text{ in} = T_k \cdot 6.4$$

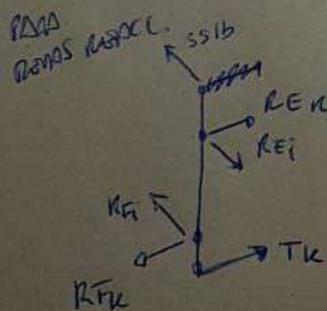
$$T_k = -82.5 \text{ lb } \hat{k}$$

$$\frac{T_k}{T_d} = \frac{110}{4.9}$$

$$T_j = -44 \text{ lb } (+\hat{j})$$

$$|T| = 93.5$$

$$\sum F_j = 0 \quad R_F = -T_j = 44 \text{ lb } \hat{j}$$



$$R_{Ek} = \frac{2.4 |T_k|}{5.2} = 38.07 \text{ lb } (-\hat{k})$$

$$R_{Fi} = 120.8 \text{ lb } \hat{i}$$

$$R_{Ei} = \frac{2.6 \cdot 55 \text{ lb}}{5.2} = 80.4 \text{ lb } (+\hat{i})$$

$$R_{Fi} = 25.4 \text{ lb } (-\hat{i})$$