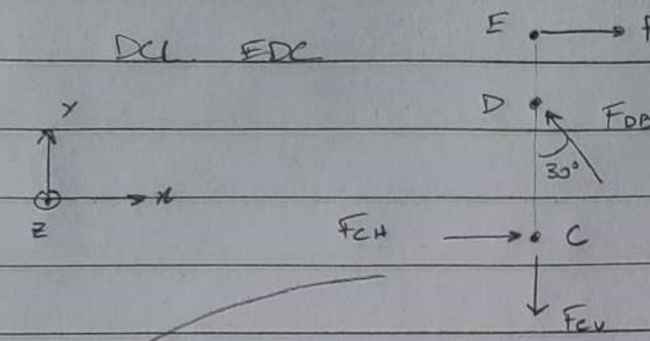
Examen 18-12-24

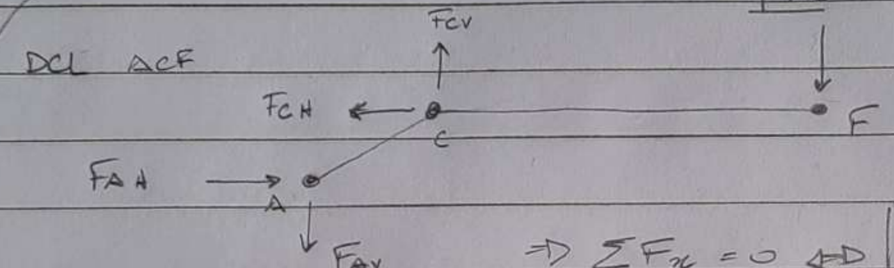
1|

DCL EDC



$$\boxed{F_K = 0{,}025\,m \times 6000\,\frac{N}{m} = 150\,N}$$

DCL ACF



$\Rightarrow \sum F_x = 0 \Leftrightarrow \boxed{F_{AH} = F_{CH}}$ (1)

$\sum F_y = 0 \Leftrightarrow F_{AV} + F_K = F_{CV}$

$\boxed{F_{AV} + 150 = F_{CV}}$ (2)

$\sum M_A(z) = 0 \Leftrightarrow F_{CV} \cdot 0{,}2 + F_{CH} \cdot 0{,}2 = F_K \cdot 1$

$\Rightarrow \boxed{F_{CV} + F_{CH} = 5F_K = 750}$ (3)

$\sum F_x = 0 \Leftrightarrow \boxed{F_{CH} + P = F_{DB}\,\text{sen}\,30}$ (4)

$\sum F_y = 0 \Leftrightarrow \boxed{F_{CV} = F_{DB}\cos 30}$ (5)

$\sum M_C(z) = 0 \Leftrightarrow F_{DB}\,\text{sen}30 \cdot 0{,}2 = P \cdot 0{,}35$

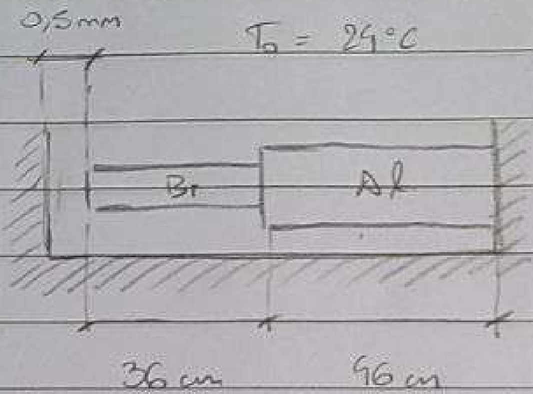
$\boxed{F_{DB} = 3{,}5\,P}$ (6)

$\Rightarrow$ Tengo 6 ecs. y 6 inc. $\Rightarrow$

F_{AH}	F_{AV}	F_{CH}	F_{CV}	F_{DB}	P		
F_{AH} +	0 −	F_{CH} +	0 +	0 +	0	= 0	(1)
0 +	F_{AV} +	0 −	F_{CV} +	0 +	0	= −150	(2)
0 +	0 +	F_{CH} +	F_{CV} +	0 +	0	= 750	(3)
0 +	0 +	F_{CH} +	0 −	$F_{DB}/2$ +	P	= 0	(4)
0 +	0 +	0 +	F_{CV} −	$0{,}87F_{DB}$ +	0	= 0	(5)
0 +	0 +	0 +	0 +	F_{DB} −	$3{,}5P$	= 0	(6)

$F_{AH} = 148{,}2N$	$F_{AV} = 451{,}8N$
$F_{CH} = 148{,}2N$	$F_{CV} = 601{,}8N$
$F_{BD} = 691{,}7N$	$P = 197{,}6N$

2



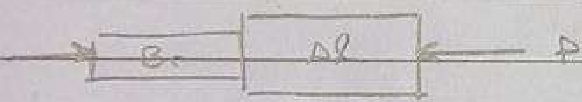
$T_0 = 24°C$

	Bronce	Aluminio
	$A = 15\,cm^2$	$A = 18\,cm^2$
	$E = 100\,GPa$	$E = 75\,GPa$
	$\alpha = 21\times10^{-6}/°C$	$\alpha = 23\times10^{-6}/°C$

a) A qué temp. el esfuerzo normal de la barra de aluminio es 76 MPa

b) Longitud de la barra de aluminio.

a) DCL de estado final ⇒ (Tocando la pared)



⇒ ¿Cómo hallo P? ⇒ $\sigma_{Al} = \frac{P}{A_{Al}} = 76\,MPa$ ⇒ $\boxed{P = 136{,}8\,kN}$

CD ⇒ $\delta_T = 0{,}5mm = \delta_{Al}(\Delta T) + \delta_{Br}(\Delta T) - \delta_{Al}(comp.) - \delta_{Br}(comp)$

$\delta_{Al}(\Delta T) = l_{0Al}\,\alpha_{Al}\,\Delta T = 0{,}46 \cdot 23\times10^{-6} \cdot \Delta T$

$\delta_{Br}(\Delta T) = l_{0Br} \cdot \alpha_{Br} \cdot \Delta T = 0{,}36 \cdot 21\times10^{-6} \cdot \Delta T$

$\delta_{Al}(comp) = \frac{P \cdot l_{0Al}}{E_{Al} \cdot A_{Al}} = 4{,}7\times10^{-4}\,m = 0{,}47\,mm$

$\frac{P}{A_{Al}} = 76MPa$

$= 91{,}2MPa$

$\delta_{Br}(comp) = \frac{P \cdot l_{0Br}}{E_{Br} \cdot A_{Br}} = 3{,}3\times10^{-4}\,m = 0{,}33\,mm$

$\Delta T\,(0{,}46\times23\times10^{-6} + 0{,}36\times21\cdot10^{-6}) + 0{,}8mm = 0{,}5mm$

$\Rightarrow \Delta T \cdot 0{,}018mm - 0{,}8mm = 0{,}5mm$

$\Delta T \cdot 0{,}018mm = 1{,}3mm \Rightarrow \boxed{\Delta T = 72\,°C} \Rightarrow \boxed{T_F = 96°C}$

b) Se despeja de ec. de C.D.

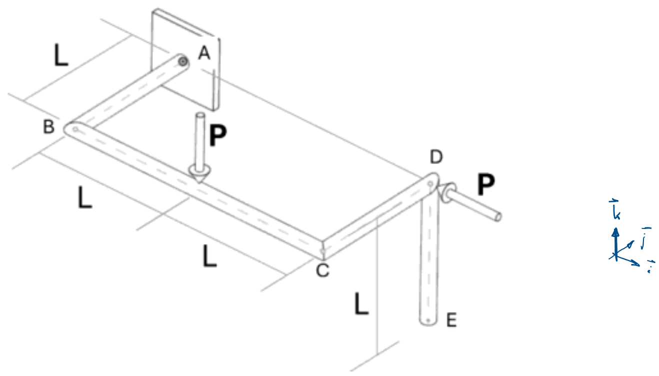
2024-12 Exam ej 3

Wednesday, December 18, 2024 6:08 AM

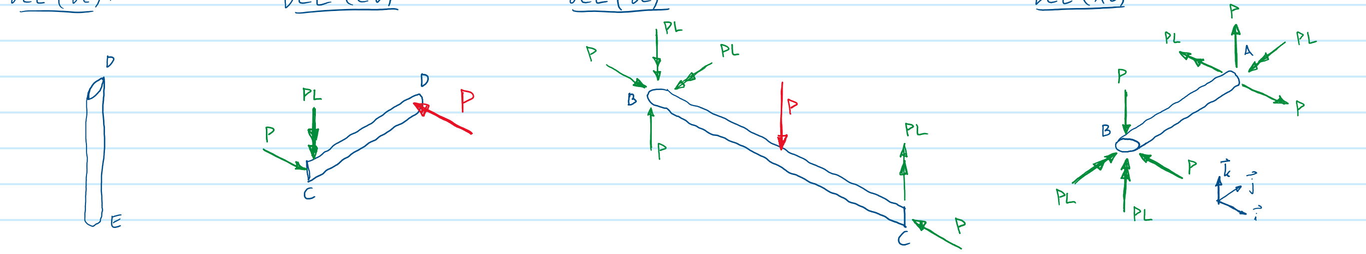
Ejercicio 3 (%)

El sistema de la figura está compuesto por tubos de acero con **Sy=200 MPa** y está sometido a dos fuerzas de magnitud **P** como se muestra en la figura. La sección tubular tiene un diámetro exterior de 50 mm y un espesor de 3 mm.
Si **L=0.5 m**, se pide:

a) Diagramas de cuerpo libre de las barras **DE, CD, BC** y **AB**, en función de **P**
b) Diagramas de esfuerzos de **BC**
c) El máximo valor de **P** admisible para la barra **BC** si se quiere que esté sometida a un **FD=2**



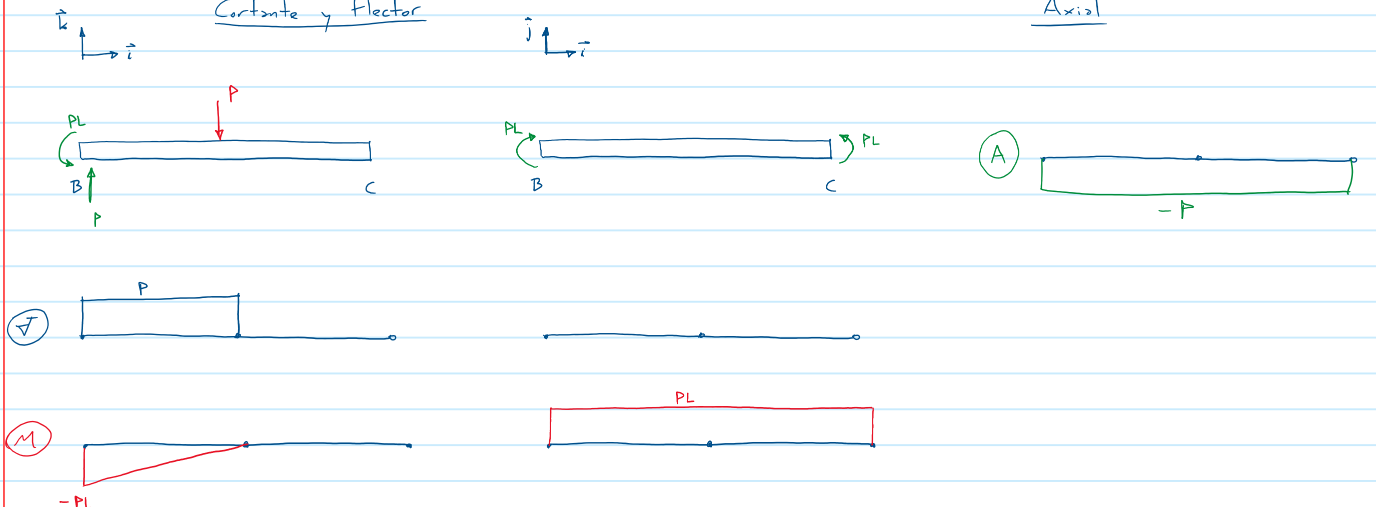
DCL (DE): DCL (CD): DCL (BC): DCL (AB):



Diagramas:

Cortante y Flector

Axial



B pto más comprometido: $M_B = \sqrt{(PL)^2 + (PL)^2} = \sqrt{2}\,PL \rightarrow \sigma_B = \dfrac{(\sqrt{2}\,PL)\,D/2}{I}$

$T = 0$

$D = P$ (directa) $\rightarrow \sigma_A = \dfrac{P}{A}$

$$\rightarrow \sigma_T = \frac{\sqrt{2}\,PLD}{2I} + \frac{P}{A} = \frac{S_y}{FD} = P\underbrace{\left(\frac{LD}{\sqrt{2}\,I} + \frac{1}{A}\right)}_{k}$$

$$\Downarrow$$

$$\boxed{P = 684\ N}$$

$$A = \frac{\pi D^2}{4} - \frac{\pi (D-2e)^2}{4} = 4.43\,(10^{-4})\ m^2 \ ; \quad I = \frac{\pi D^4}{64} - \frac{\pi (D-2e)^4}{64} = 1.23\,(10^{-7})\ m^4$$