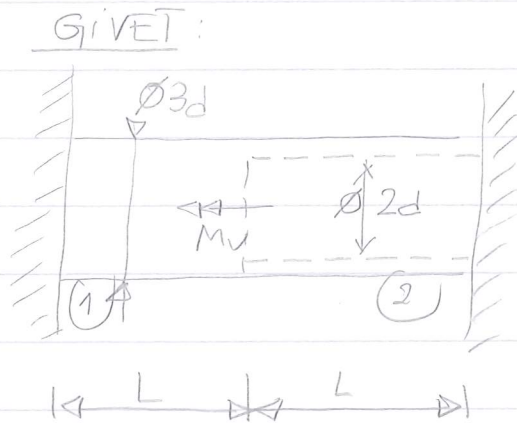


2.6. 15



Materialen är  
elastiskt idealplastiskt  
 $G, \tau_s$

SÖKT  $M_x$  när plasticeringen börjar

LÖSNING:

Hitta  $M_{vs}$ : vilken del börjar plasticera först.

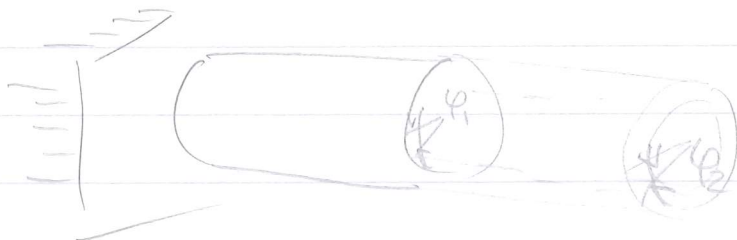
1.- snitta och jmv



$$jmv: \underline{M_{v1} + M_v = M_{v2}} \quad (1)$$

1ekv  
2obek  $\rightarrow$  STATISK  
OBESTÄMT.

2.- Deformationssamband.



$$\underline{\varphi_{tot} = 0 = \varphi_1 + \varphi_2} \quad (2)$$

3.- Förvrindningsvinkel.

$$\varphi_1 = \frac{M_{v1} L_1}{G k_1} \begin{cases} M_{v1} ? \\ L_1 = L \\ k_1 = \frac{\pi}{2} \left( \left( \frac{3d}{2} \right)^4 - 0 \right) = \frac{81\pi d^4}{32} \end{cases}$$

$$\varphi_1 = \frac{32 M_{v1} L}{81 G \pi d^4} \quad (4)$$

$$\varphi_2 = \frac{M_{v2} L_2}{G k_2} \begin{cases} M_{v2} = M_{v1} + M_v \\ L_2 = L \\ k_2 = \frac{\pi}{2} \left( \left( \frac{3d}{2} \right)^4 - d^4 \right) \end{cases}$$

$$\varphi_2 = \frac{32 (M_{v1} + M_v) L}{65 G \pi d^4} \quad (5) \begin{cases} = \frac{\pi}{2} \left( \frac{81d^4}{16} - \frac{16d^4}{16} \right) \\ = \frac{\pi}{2} \frac{65}{16} d^4 \end{cases}$$

(5) och (4) i (2):

$$\frac{32 M_{v1} \cancel{L}}{81 \cancel{G} \pi \cancel{d^4}} + \frac{32 (M_{v1} + M_v) \cancel{L}}{65 \cancel{G} \pi \cancel{d^4}} = 0$$

$$\left( \frac{\cancel{32}}{81} + \frac{\cancel{32}}{65} \right) M_{v1} = - \frac{\cancel{32}}{65} M_v$$

$$M_{v1} = - \frac{81.65}{146.65} M_v$$

$$\begin{cases} M_{v1} = -\frac{81}{146} M_v \rightarrow i(1) \\ M_{v2} = \frac{65}{146} M_v \leftarrow \end{cases}$$

4 - Skjuvspänningar, vilken är störst?

$$\tau_{\max 1} = \frac{M_{v1}}{W_1} = \begin{cases} M_{v1} = -81/146 M_v \\ W_1 = \frac{\pi}{2 \left( \frac{3d}{2} \right)} \left( \frac{3d}{2} \right)^4 = \frac{\pi \pi 27 d^3}{16} \end{cases}$$

$$\tau_{\max 1} = -\frac{24 M_v}{173 \pi d^3}$$

$$\tau_{\max 2} = \frac{M_{v2}}{W_2} = \begin{cases} M_{v2} = 65/146 M_v \\ W_2 = \frac{\pi}{2 \left( \frac{3d}{2} \right)} \frac{65}{16} d^4 = \frac{\pi 65 d^3}{48} \end{cases}$$

$$\tau_{\max 2} = \frac{24 M_v}{73 \pi d^3}$$

$$|\tau_{\max 1}| = |\tau_{\max 2}| = \tau_s \Rightarrow \text{Båda börjar plastis.}$$

$$\boxed{M_{vs} = \frac{43}{24} \pi d^3 \tau_s}$$