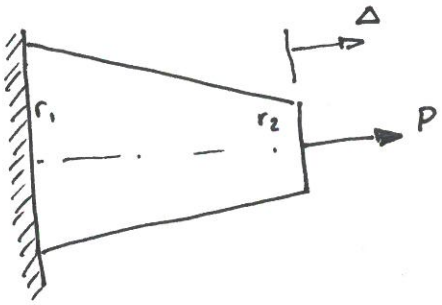
2.1.16.

Givet

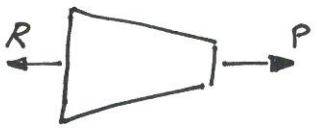


× Konisk stav
× Cirkulärt tvärsnitt
× Lin. el. mtrl (E)

Sökt Kraft – deformation samband ($P(\delta)$ alt. $\delta(P)$)

Lösning

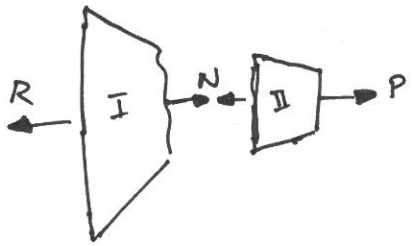
1. Frilägg



2. Jämviht

$\rightarrow: -R+P=0 \iff \underline{\underline{R=P}}$

3. Snitta
(Intär x-riktning med start vid väggen)



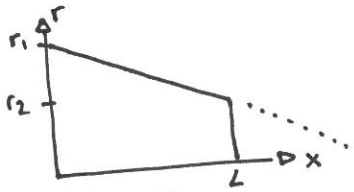
4. Jämviht

$\rightarrow_I: -R+N=0$
$\iff \underline{\underline{N=P}}$

4. Normalspänning

Def. $\left[\sigma = \frac{N}{A}\right] \Rightarrow \sigma(x) = \frac{N}{A(x)}$ där $A(x) = \pi r^2(x)$

$r(x)$ ....



$\Rightarrow \underline{\underline{r(x) = r_1 + \frac{r_2 - r_1}{L} \cdot x}}$

{ Anm. "Räta linjens ekv"

$\therefore \sigma(x) = \frac{P}{\pi\left(r_1 + \frac{r_2 - r_1}{L} \cdot x\right)^2}$

5. Konstitutivt samband (materialsamband)
Hookes lag ty lin. el. mtrl $\Rightarrow \sigma(x) = E\varepsilon(x)$

Normaltöjning $\varepsilon(x) = \frac{P}{\pi E\left(r_1 + \frac{r_2 - r_1}{L} x\right)^2}$

$\Rightarrow$

2.1.16

forts 1

6. Deformation

Def. normaltöjning $\varepsilon(x) = \dfrac{d\delta(x)}{dx} \Longrightarrow \displaystyle\int_0^{\delta} d\delta(x) = \int_0^{L} \varepsilon(x)\,dx$

ger att $\delta(x) = \displaystyle\int_0^{L} \frac{P}{E\pi\left(r_1 + \frac{r_2 - r_1}{L} \cdot x\right)}\,dx$

$= \left\{ \begin{array}{l} \text{anv. exempelvis} \\ \text{BETA s.153} \\ \text{ekv 5:7 ekv 6} \end{array} \right\} \Rightarrow \delta = \dfrac{PL}{\pi E r_1 r_2}$

Dvs sambandet mellan deformation och kraft!