

1.3.18

GIVET

obelastad yta av en plåt.

(I)

$$\sigma_x = 20 \text{ MPa}$$

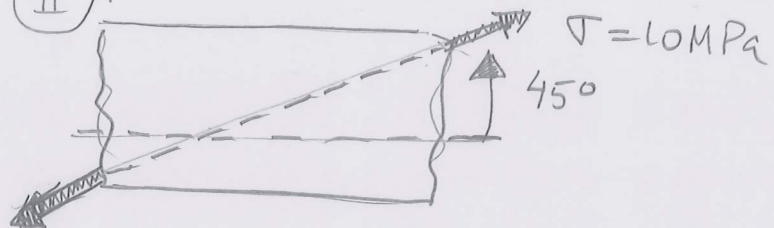
$$\sigma_y = -25 \text{ MPa}$$

$$\tau_{xy} = 10 \text{ MPa}$$

$$E = 290 \text{ GPa}$$

$$\nu = 0.03$$

(II)

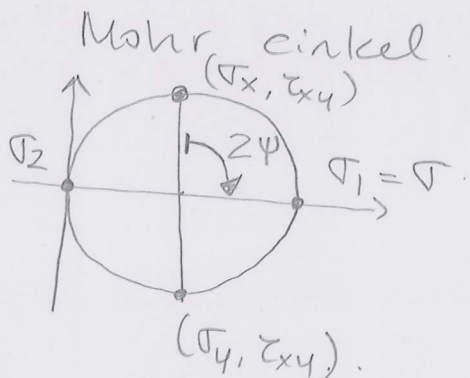


SÖKT: Bestäm huvudspänningar/riktning.

LÖSNING: $\sigma_z = \tau_{xz} = \tau_{yz} = 0 \rightarrow$ $\left\{ \begin{array}{l} \text{Plant spänning} \\ \text{z huvudriktning} \\ \sigma_z \text{ huvudspänning} \end{array} \right.$

1.- Samla ihop (I) och (II):

(II) $\rightarrow \sigma_x^{\text{II}}, \sigma_y^{\text{II}}, \tau_{xy}^{\text{II}} ?$



$$\left\{ \begin{array}{l} \sigma_x^{\text{II}} = \sigma/2 \\ \tau_{xy}^{\text{II}} = \sigma/2 \\ \sigma_y^{\text{II}} = \sigma/2 \end{array} \right.$$

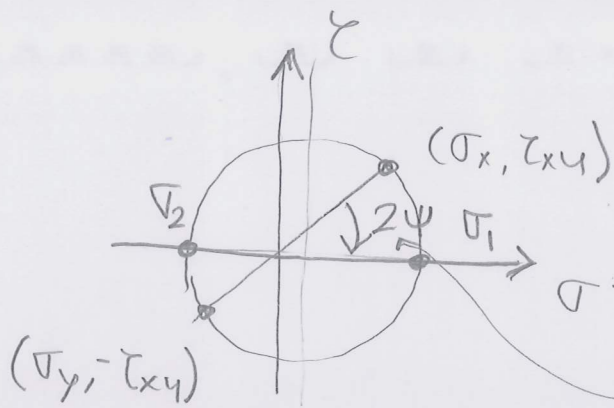
$$\sigma_x = \sigma_x^{\text{I}} + \sigma_x^{\text{II}} = 25 \text{ MPa}$$

$$\sigma_y = \sigma_y^{\text{I}} + \sigma_y^{\text{II}} = -20 \text{ MPa}$$

$$\tau_{xy} = \tau_{xy}^{\text{I}} + \tau_{xy}^{\text{II}} = 15 \text{ MPa}$$

2.- Huvudspänningar m.h.a. Mohrs cirkel.
(2D)

[F.S. (1.19)]



$$\sigma_1 = 29,54 \text{ MPa}$$

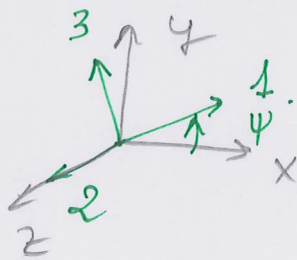
$$\sigma_2 = -24,54 \text{ MPa}$$

$$2\psi^* = 33,68^\circ$$

$$\underline{\underline{\psi = 16,84^\circ}}$$

3. - huvudspänningar i 3D.

$$\sigma_1 \geq \sigma_2 \geq \sigma_3$$



$$\text{huvudspänn.} \left\{ \begin{array}{l} \sigma_1 = 29,54 \text{ MPa} \\ \sigma_2 = 0 \text{ MPa} \\ \sigma_3 = -24,54 \text{ MPa} \end{array} \right.$$

$$\text{huvudriktningar} \left\{ \begin{array}{l} \underline{n}_1 = [\cos\psi \quad \sin\psi \quad 0]^T \\ \underline{n}_2 = [0 \quad 0 \quad 1]^T \\ \underline{n}_3 = [\cos(\psi+90) \quad \sin(\psi+90) \quad 0]^T \end{array} \right.$$