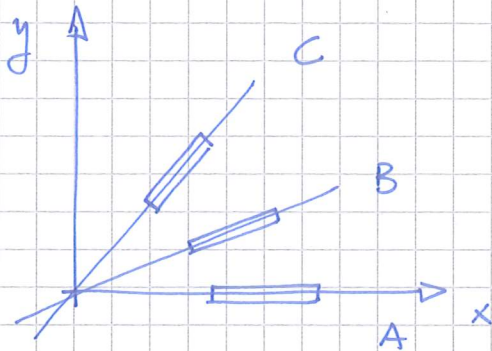


1.3.14

GWET



$$\epsilon_{0A} = 0.00014$$

$$\epsilon_{0B} = 0.00012$$

$$\epsilon_{0C} = -0.00002$$

$$E = 70 \text{ GPa}$$

$$\nu = 0.35$$

A). Spänningstillståndet

B) Huvudspänningar/riktningar.

LÖSNING:

① Hitta  $\epsilon_x, \epsilon_y, \gamma_{xy}$  (PLANT spänning p.g.a inga krafter i z-led  $\sigma_z = \tau_{xz} = \tau_{yz} = 0$ )

$$(1) \epsilon_x = \epsilon_{0A}$$

$$(2) \epsilon_{0B} = \epsilon(30) = \epsilon_x \cos^2(30) + \epsilon_y \sin^2(30) + \gamma_{xy} \cos(30) \sin(30)$$

$$(3) \epsilon_{0C} = \epsilon(60) = \epsilon_x \cos^2(60) + \epsilon_y \sin^2(60) + \gamma_{xy} \cos(60) \sin(60)$$

$$(2) \text{ och } (1) \Rightarrow \epsilon_{0B} = \epsilon_{0A} \frac{3}{4} + \epsilon_y \frac{1}{4} + \frac{\sqrt{3}}{4} \gamma_{xy} \quad \left. \begin{array}{l} 2 \text{ ekv} \\ 2 \text{ okänt} \end{array} \right\}$$

$$(3) \text{ och } (1) \Rightarrow \epsilon_{0C} = \epsilon_{0A} \frac{1}{4} + \epsilon_y \frac{3}{4} + \frac{\sqrt{3}}{4} \gamma_{xy}$$

$$\Rightarrow \begin{cases} \epsilon_y = -1.4 \cdot 10^{-4} \\ \gamma_{xy} = 2/\sqrt{3} \cdot 10^{-4} \end{cases}$$

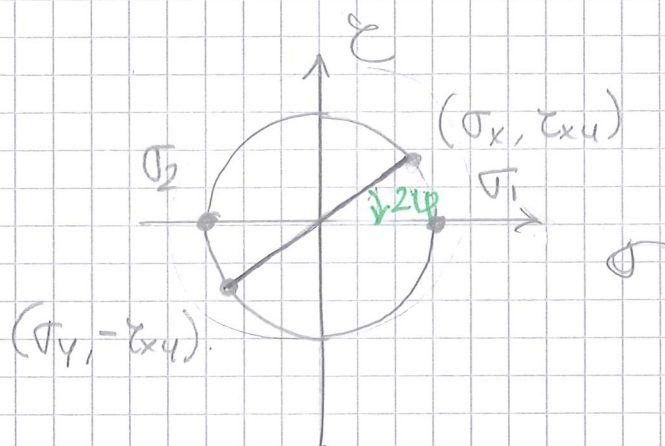
② - Hitta spänningarna m.h.a Hookes lag. [FS(3.3)]

$$\sigma_x = \frac{E}{(1-\nu^2)} (\epsilon_x + \nu \epsilon_y) = 7.26 \text{ MPa}$$

$$\sigma_y = \frac{E}{(1-\nu^2)} (\epsilon_y + \nu \epsilon_x) = -7.26 \text{ MPa}$$

$$\tau_{xy} = G \cdot \gamma_{xy} = \frac{E}{2(1+\nu)} \gamma_{xy} = 2.99 \text{ MPa}$$

③ Huvudspänningarna: m.h.a Mohrs cirkel



$$R = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\sigma_1 = \frac{1}{2} (\sigma_x + \sigma_y) + R = 7.85 \text{ MPa}$$

$$\sigma_2 = \frac{1}{2} (\sigma_x + \sigma_y) - R = -7.85 \text{ MPa}$$

$$2\psi^* = \arctan\left(\frac{2\tau_{xy}}{\sigma_x - \sigma_y}\right) = 22.4^\circ$$

↑  
miniriktningen

$$2\psi = 2\psi^* \Rightarrow \underline{\underline{\psi = 11.2^\circ}}$$

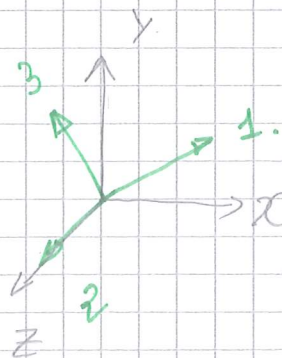
↑

$$0 < 2\psi < 90$$

④ Huvudspänningar / riktningar i 3D

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

$$\begin{cases} \sigma_1 = 7.85 \text{ MPa} \\ \sigma_2 = 0 \text{ MPa} \\ \sigma_3 = -7.85 \text{ MPa} \end{cases}$$



$$\underline{\underline{u_1}} = [\cos \psi \quad \sin \psi \quad 0]^T$$

$$\underline{\underline{u_2}} = [0 \quad 0 \quad 1]^T$$

$$\underline{\underline{u_3}} = [\cos(90+\psi) \quad \sin(90+\psi) \quad 0]^T$$