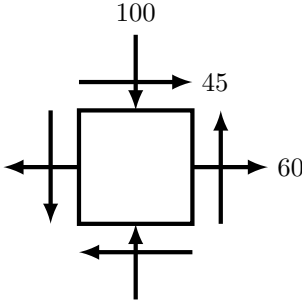


## 0.1 Örnek



Şekilde görülen gerilme hâlinde;

$$\begin{aligned}\sigma_x &= 60 \text{ N/mm}^2 \\ \sigma_y &= -100 \text{ N/mm}^2 \\ \tau_{xy} &= 45 \text{ N/mm}^2 \text{ dir.}\end{aligned}$$

- Normali yatay eksenle  $30^\circ$ 'lik açı yapan bir yüzeydeki  $\sigma$  ve  $\tau$  gerilmelerini;
- Asal normal gerilmeleri ve doğrultularını;
- Asal kayma gerilmelerini hesaplayınız.

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**a. Normali yatay eksenle  $30^\circ$ 'lik açı yapan bir yüzeydeki  $\sigma$  ve  $\tau$  gerilmeleri :**

$\sigma$  değerinin hesaplanması:

$$\sigma = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cdot \cos 2\varphi + \tau_{xy} \cdot \sin 2\varphi$$

$$\sigma = \frac{60 - 100}{2} + \frac{60 + 100}{2} \cdot \cos 60 + 45 \cdot \sin 60$$

$$\sigma = -20 + 40 + 38.97$$

$$\underline{\sigma = 58.97 \text{ N/mm}^2}$$

$\tau$  değerinin hesaplanması:

$$\tau = -\frac{\sigma_x - \sigma_y}{2} \cdot \sin 2\varphi + \tau_{xy} \cdot \cos 2\varphi$$

$$\tau = -\frac{60 - 100}{2} \cdot \sin 60 + 45 \cdot \cos 60$$

$$\tau = -69.28 + 22.5$$

$$\underline{\tau = -46.78 \text{ N/mm}^2}$$

**b. Asal normal gerilmeler ve doğrultuları :**

$\sigma_1$  ve  $\sigma_2$  değerlerinin hesaplanması:

$$\sigma_{1,2} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\sigma_{1,2} = \frac{60 - 100}{2} \pm \sqrt{\left(\frac{60 + 100}{2}\right)^2 + 45^2}$$

$$\sigma_{1,2} = -20 \pm 91.79$$

$$\underline{\sigma_1 = 71.79 \text{ N/mm}^2}$$

$$\underline{\sigma_2 = -111.79 \text{ N/mm}^2}$$

$\varphi_0$  değerinin hesaplanması:

$$\operatorname{tg} 2\varphi_0 = \frac{2 \cdot \tau_{xy}}{\sigma_x - \sigma_y}$$

$$\operatorname{tg} 2\varphi_0 = \frac{2 \cdot 45}{60 + 100}$$

$$\operatorname{tg} 2\varphi_0 = \frac{90}{160}$$

$$\operatorname{tg} 2\varphi_0 = 0.5625$$

$$\underline{\varphi_0 = 14.7^\circ}$$

$$\underline{\varphi_0 = 104.7^\circ}$$

## c. Asal kayma gerilmeleri :

 $\tau_{max}$  ve  $\tau_{min}$  değerlerinin hesaplanması:

$$\tau_{\max/\min} = \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\tau_{\max/\min} = \pm \frac{\sigma_1 - \sigma_2}{2}$$

$$\tau_{\max/\min} = \pm \sqrt{\left(\frac{60 + 100}{2}\right)^2 + 45^2}$$

$$\tau_{\max/\min} = \pm \frac{71.79 + 111.79}{2}$$

$$\tau_{\max/\min} = \pm 91.79 \text{ N/mm}^2$$

$$\tau_{\max/\min} = \pm 91.79 \text{ N/mm}^2$$

