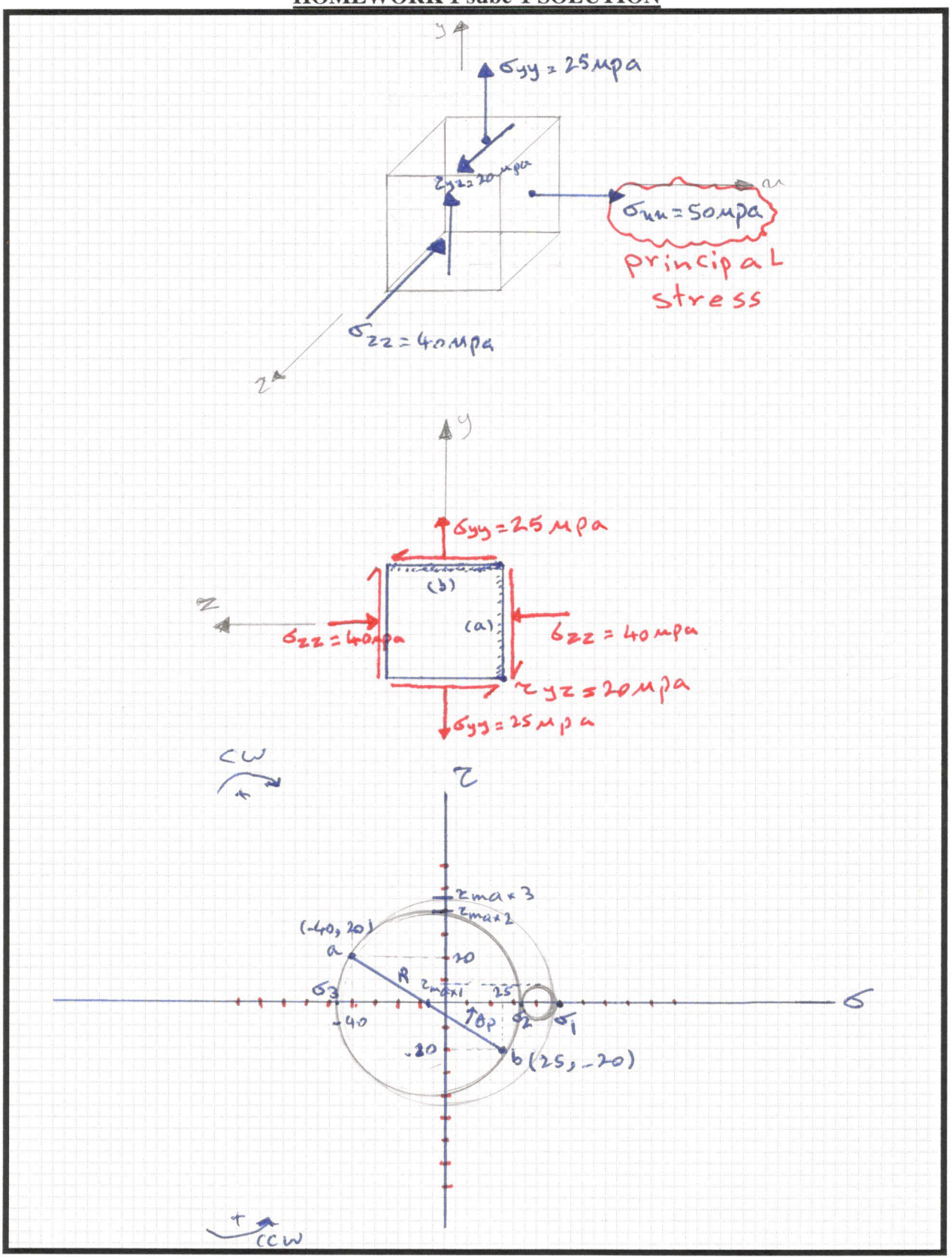
TOBB EKONOMİ VE TEKNOLOJİ ÜNİVERSİTESİ

MAK 312 Makine Elemanlari – 2015 Fall

HOMEWORK 1 sube-1 SOLUTION



Prepared by:

September, 21, 2015

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$$\sigma_{avg} = \frac{\sigma_{yy}+\sigma_{zz}}{2} = \frac{25-40}{2} = -7.5 \text{ Mpa}$$

$$R = \sqrt{(20)^2 + (32.5)^2} = 38.2$$

$$\sigma_2 = \sigma_{avg} + R = -7.5 + 38.2 = 30.7 \text{ Mpa}$$

$$\sigma_3 = \sigma_{avg} - R = -7.5 - 38.2 = -45.7 \text{ Mpa}$$

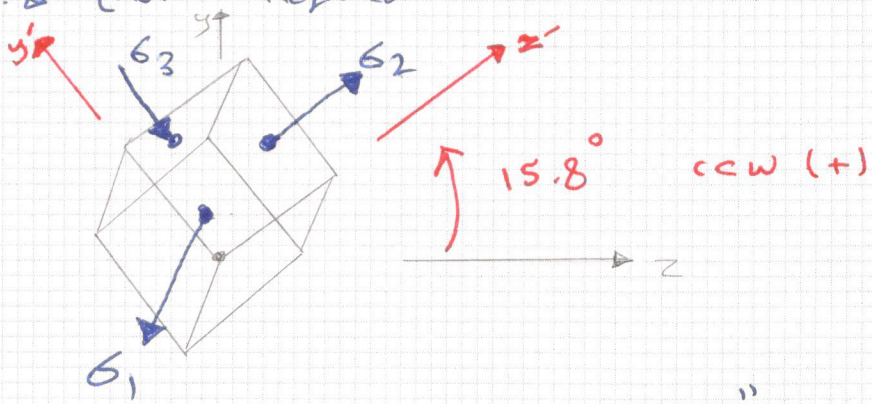
$$\tau_{max1} = \frac{\sigma_1 - \sigma_3}{2} = \frac{50-(-45.7)}{2} = 47.85 \text{ Mpa}$$

$$\tau_{max2} = \frac{\sigma_2 - \sigma_3}{2} = \frac{30.7-(-45.7)}{2} = 38.2 \text{ Mpa}$$

$$\tau_{max3} = \frac{\sigma_1 - \sigma_2}{2} = \frac{50-30.7}{2} = 9.65 \text{ Mpa}$$

$$\tan\theta_p = \frac{20}{32.5} \Rightarrow \theta_p = \text{Arctan}\left(\frac{20}{32.5}\right) = 31.6^\circ$$

$$\beta = \frac{\theta_p}{2} = 15.8^\circ \text{ (Rotation Required to achieve principal stress)}$$



"The cube at principal stress plane"

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