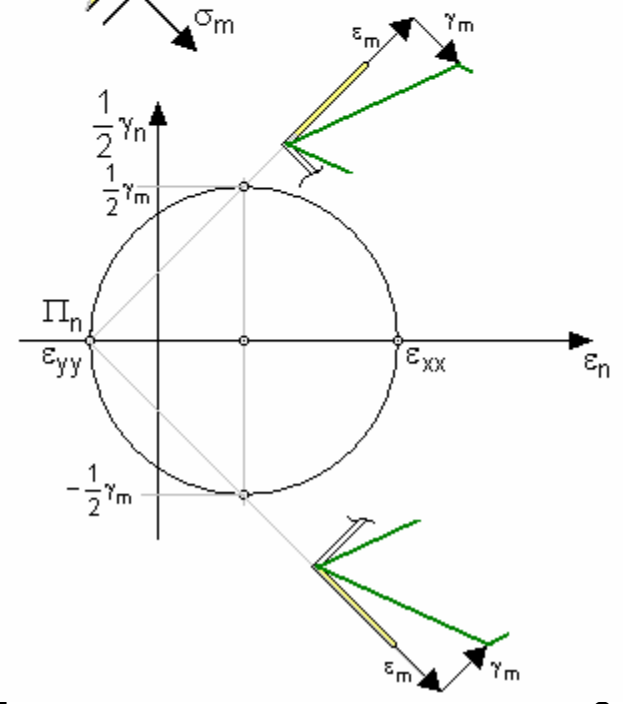
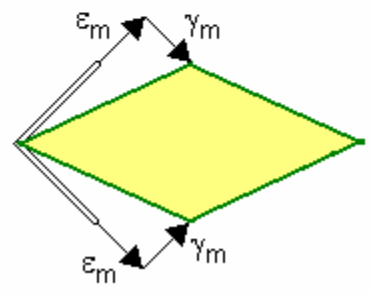
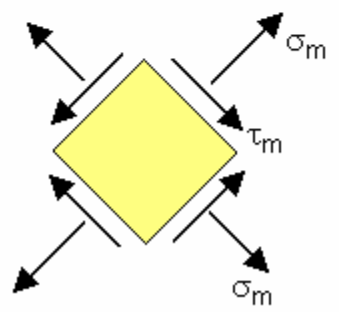
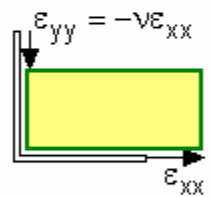
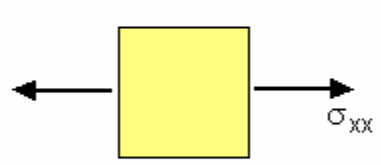
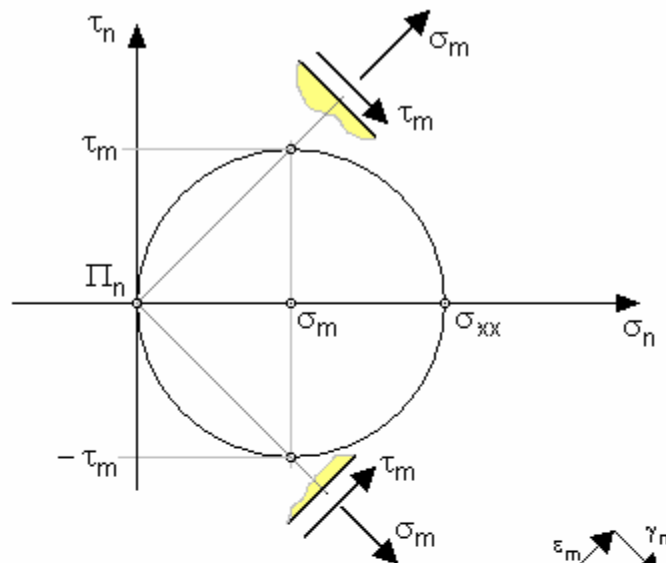
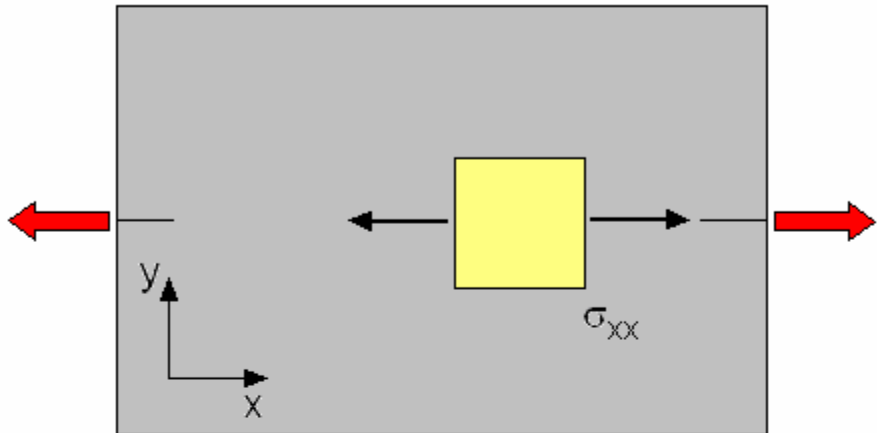


Σχέσεις τάσεων τροπών στο πλαίσιο της γραμμικής θεωρίας Ελαστικότητας για ισότροπα υλικά

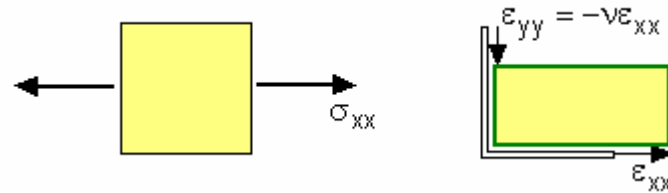
T. Μηχ. II
Απρίλιος 2005

Απλός εφελκυσμός και διάτμηση σε εστραμμένους άξονες



Μέτρα Ελαστικότητας

$$\varepsilon_{xx} = \frac{\sigma_{xx}}{E} \quad , \quad \varepsilon_{yy} = -\nu\varepsilon_{xx}$$

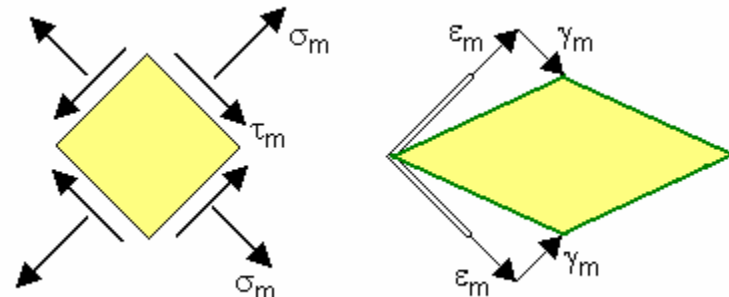


$$\tau_m = \frac{1}{2}\sigma_{xx} \quad \Rightarrow \quad \sigma_{xx} = 2\tau_m$$

$$\frac{1}{2}\gamma_m = \frac{1}{2}(\varepsilon_{xx} - \varepsilon_{yy}) \quad \Rightarrow \quad \gamma_m = \frac{\sigma_{xx}}{E} - (-\nu\varepsilon_{xx})$$

$$\gamma_m = \frac{\sigma_{xx}}{E} + \nu\frac{\sigma_{xx}}{E} = \frac{1+\nu}{E}\sigma_{xx} = \frac{1+\nu}{E}2\tau_m \quad \Rightarrow$$

$$\tau_m = G\gamma_m \quad , \quad G = \frac{E}{2(1+\nu)}$$

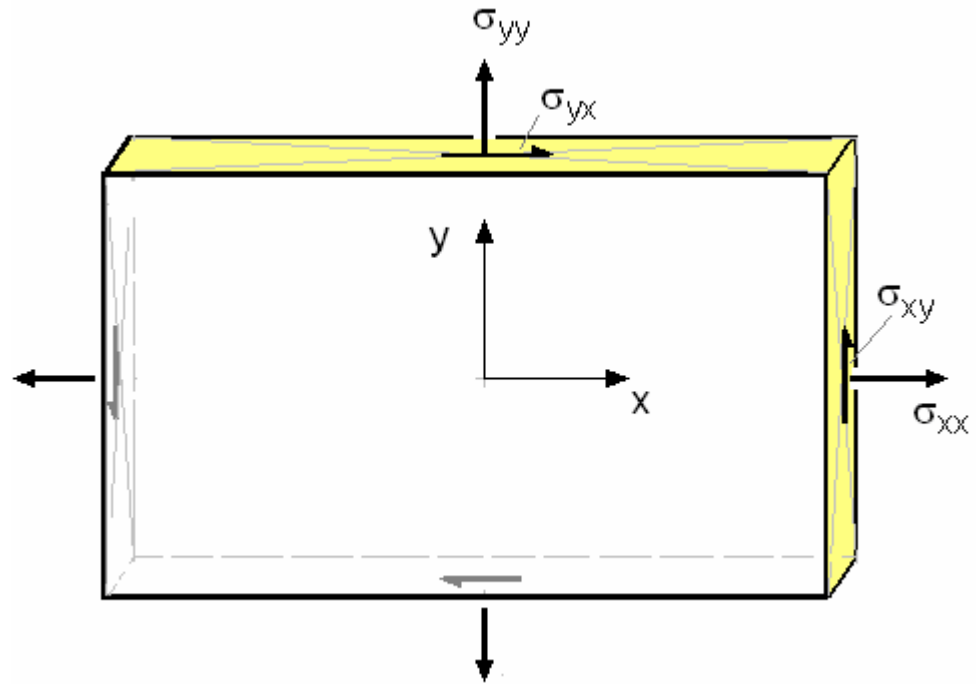


Επίπεδη ένταση (ισόθερμες παραμορφώσεις)

$$\varepsilon_{xx} = \frac{1}{E} (\sigma_{xx} - \nu \sigma_{yy})$$

$$\varepsilon_{yy} = \frac{1}{E} (-\nu \sigma_{xx} + \sigma_{yy})$$

$$\varepsilon_{xy} = \frac{1}{2G} \sigma_{xy}$$



$$\varepsilon_{xx} = \frac{1}{E} (\sigma_{xx} - \nu\sigma_{yy}) + \alpha\Delta T$$

$$\varepsilon_{yy} = \frac{1}{E} (-\nu\sigma_{xx} + \sigma_{yy}) + \alpha\Delta T$$

$$\varepsilon_{xy} = \frac{1}{2G} \sigma_{xy}$$

$$\sigma_{zz} = 0 \quad , \quad \varepsilon_{zz} = -\frac{\nu}{E} (\sigma_{xx} + \sigma_{yy}) + \alpha\Delta T$$

Σχέσεις τάσεων-τροπών (επίπεδη ένταση)

$$\sigma_{xx} = \frac{E}{1-\nu^2} (\varepsilon_{xx} + \nu\varepsilon_{yy})$$

$$\sigma_{yy} = \frac{E}{1-\nu^2} (\nu\varepsilon_{xx} + \varepsilon_{yy})$$

$$\sigma_{xy} = 2G\varepsilon_{xy}$$

$$\sigma_{zz} = 0 \quad , \quad \varepsilon_{zz} = -\frac{\nu}{E} (\sigma_{xx} + \sigma_{yy})$$