

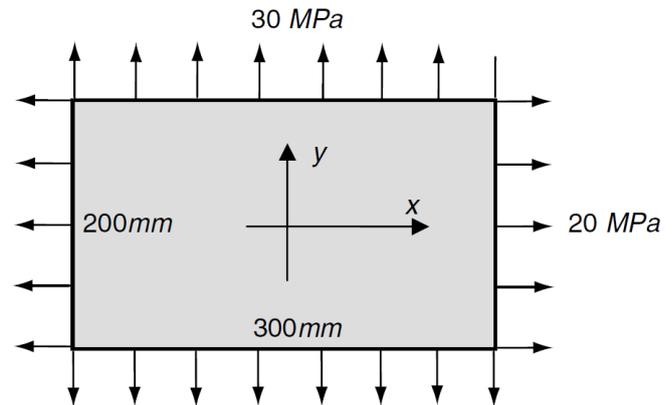
1. For isotropic materials show that the principal axes of strain coincide with the principal axes of stress. Further, show that the principal stresses can be expressed in terms of the principal strains as

$$\sigma_i = 2G\varepsilon_i + \lambda\varepsilon_{kk}, \quad i = 1, 2, 3$$

2. Show that Hooke's law for an isotropic material may be expressed in terms of spherical and deviatoric tensors by the two relations

$$\tilde{\sigma}_{ij} = 3K\tilde{\varepsilon}_{ij}, \quad \hat{\sigma}_{ij} = 2G\hat{\varepsilon}_{ij}.$$

3. A rectangular steel plate (thickness 4 mm) is subjected to a uniform biaxial stress field as shown in the following figure. Assuming all fields are uniform, determine changes in the dimensions of the plate under this loading. Check the lecture notes for values of elastic constants.



4. Consider the one-dimensional thermoelastic problem of a uniform bar constrained in the axial x direction but allowed to expand freely in the y and z directions, as shown in the following figure. Taking the reference temperature to be zero, find the stress and strain states in the bar.

