

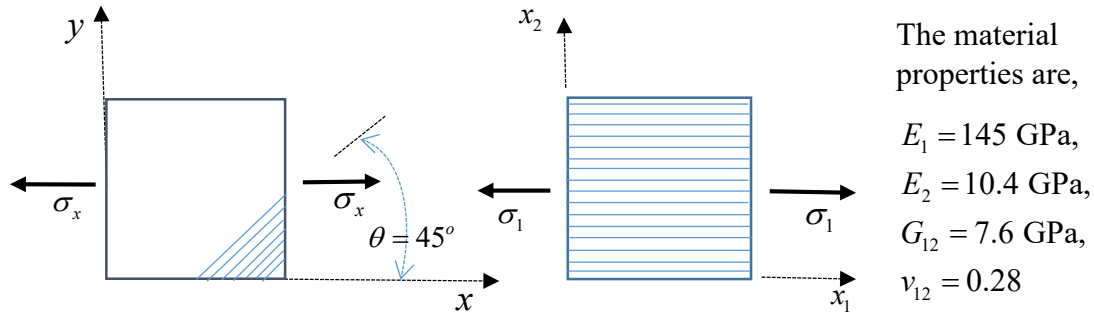
**Exercise 1:** Show that when,

$$E_1 = E_2 \text{ and } G_{12} = \frac{E_1}{2(1 + \nu_{12})},$$

the material is isotropic.

Hind: Use the first relation in (D.36) and show that the modulus is independent of orientation.

**Exercise 2:** Two specimens of an orthotropic material (unidirectional laminate) are subjected to uniaxial traction, as shown in the Figure below, with  $\sigma_x = \sigma_1 = \sigma$ . Calculate the resulting lateral strain.



**Exercise 3:** A uniaxial lamina is loaded in pure shear  $\sigma_{xy} = \tau$  at  $45^\circ$  with the principal material system axes as shown below. Express the resulting strain components in terms of the orthotropic elastic constants  $E_1, E_2, G_{12}, \nu_{12}$  (or  $\nu_{21}$ ).

