

MAE 415 – Analysis of Structures

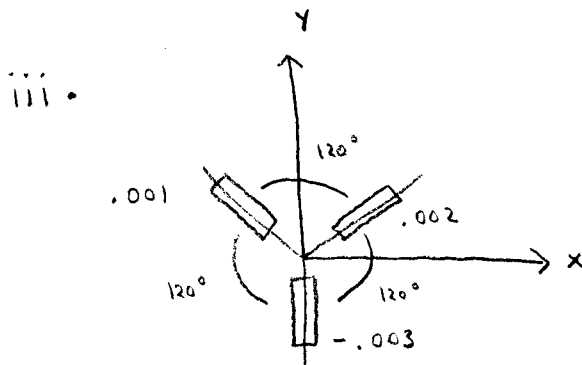
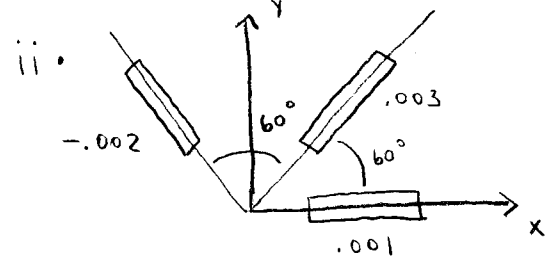
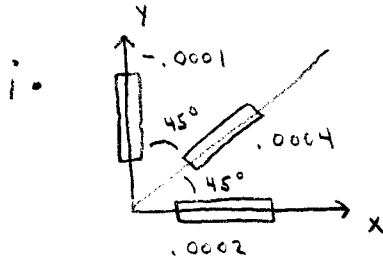
Instructors: Bloebaum/Hulme

Assignment #3

Due date: 9/22/00, BEFORE class begins

Class web page: <http://www.eng.buffalo.edu/~clb/mae415.html>

1. For the 3 strain gage configurations shown:
 - a. Determine the values of the in-plane strains. Assume that the z-axis is perpendicular to the plane of the strain gage.
 - b. Determine the values and orientations of the principal strains.



2. Given an isotropic material with the following parameters:

$$\lambda = 5.769 \times 10^6 \text{ psi}$$

$$\mu = 3.846 \times 10^6 \text{ psi}$$

$$\Delta T = 2.5 \text{ }^\circ\text{C}$$

$$\alpha = 5.0 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$$

$$\epsilon = [0.001 \quad ? \quad 0.0055 \quad ? \quad ? \quad 0.0025]^T$$

$$\sigma = [? \quad 2.0 \quad ? \quad 0.75 \quad 0.5 \quad ?]^T \times 10^5 \text{ psi}$$

- a. Find all unknown components of the stress and strain tensors.
- b. What temperature variation would be required to induce an additional 0.1% longitudinal elongation in the z-direction?
- c. Given the temperature variation computed in part b, what is the new strain tensor?