

AOE 3024, Thin Walled Structures

Homework # 5, Due October 10, 2001

NAME

Pledge

1. The three displacement components u , v , and w for a cantilever beam, of length l , under a tip load P are given as:

$$\begin{aligned}u &= -\frac{Px^2y}{2EI} - \nu\frac{Py^3}{6EI} + \frac{Py^3}{6GI} + \left(\frac{Pl^2}{2EI} - \frac{Pc^2}{2GI}\right)y \\v &= \nu\frac{Pxy^2}{2EI} + \frac{Px^3}{6EI} - \frac{Pl^2x}{2EI} + \frac{Pl^3}{3EI} \\w &= 0\end{aligned}\tag{1}$$

Here E is the Young's modulus, ν is the Poisson's ratio, and $G = \frac{E}{2(1+\nu)}$ is the shear modulus of the beam material; and I is the moment of inertia of the beam cross-section, and $2c$ is the height of the beam.

For this beam, determine all the strain components. (10 points)

2. The strain gage measurements from a rosette are given as:

$$\epsilon_x = 2000 \mu$$

$$\epsilon_{x+45^\circ} = 1350 \mu$$

$$\epsilon_y = 950 \mu$$

Here $\mu = 10^{-6}$ is called microstrain. Determine the principal strains from the above three measurements. Draw the Mohr circle. (15 points)