Engr325 Lab #8 Winter, 2020

Strain Gauges

Name _____

Partner (s)_____ Grade _____/10

Introduction
The goal of this lab is to utilize strain gauges to make measurements and calculations regarding a cantilever beam made of an unknown metal. You will apply a known force to a cantilever beam and use changes in resistance to calculate Young's modulus of the material.

Objectives
- Gain experience with strain gauges;
- Understand the relationship between stress, strain, and change in resistance;
- Use the change in resistance with applied stress to calculate the Young's modulus for an unknown material.

Equipment Provided
- Cantilever beam with solid mount and pre-mounted strain gauges;
- Appropriate weights for adding a load;
- Linear distance measurement tools;
- Circuit components as necessary;
- Computer with appropriate software.

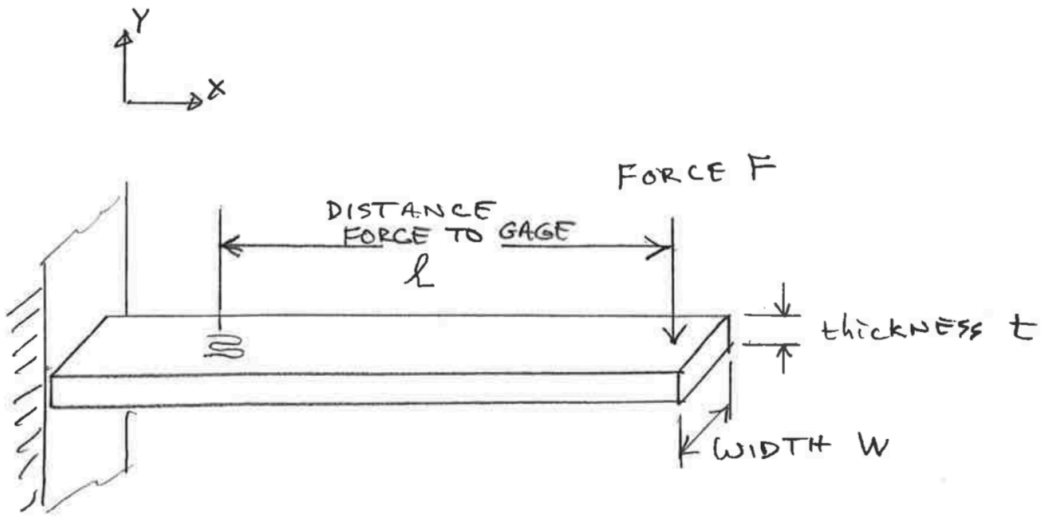
References
- Textbook, class notes, web sites.

Procedure
1) Anchor the cantilever base to a table.
2) Measure the strain gauge resistances using the Fluke 8846A.

   $R_{compression}$ _____ Ω $R_{tension}$ _____ Ω

3) Apply load(s).
4) Measure dimensions of the cantilever arm.
5) Calculate the modulus of elasticity of the cantilever arm material.

To Turn In
Write a short summary (one-page double spaced maximum) with a description of your methods, results, and observations about this lab. Staple your summary sheet to this lab handout and turn it in.



σ = STRESS

ε = STRAIN

E = YOUNG'S MODULUS $\quad E = \frac{\sigma}{\varepsilon}$

M = MOMENT = $F \times \ell$

I = CENTROIDAL MOMENT OF INERTIA = $\frac{1}{12} W t^3$

y = DISTANCE FROM NEUTRAL AXIS TO SURFACE = $\frac{\text{thickness}}{2}$

$$\sigma = \frac{My}{I}$$

$$\varepsilon = \frac{1}{G} \frac{\Delta R}{R}$$

WHERE G = GAUGE FACTOR

$R \approx 120\ \Omega$