Engineering 1181: Lab Memo content and guidelines. Beam Bending Lab

Your lab should be submitted one week after the lab on Blackboard. Delete the instructions given here from your report. Avoid saying ‘I’ in a technical paper. Each student must submit an individual report.

Your first page should be on a single page and be similar to the following example:

Beam Bending Lab Report

Submitted to

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Prepared By

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Engineering 1181

Semester & year

Columbus State Community College

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**Executive Summary**

(This should be less than one page long. This is what a busy executive might read instead of the whole report. Summarize how the experiment was done and the results. Do not include any part of these instructions in your report! )

1. **Introduction and Purpose**

This text should be justified with no tab and the second line of the text is also not tabbed. You do not need to write a funnel for the introduction to a memo. Two or three sentences with one of them being the purpose is sufficient for an introduction.

**Make sure to leave an extra line between paragraphs for clarity purposes**

1. **Data**

Show the graphs you generated in this section.

Each graph should contain the following:

* Labeled axes with units in parenthesis
* Graph Title with the format Deflection vs. Force for Steel Flanged Beam
* Legend if there is more than one set of data plotted on the graph.
* Linear curve fit with equation displayed on the graph.

Example:

Figure 1: Deflection versus Force for Solid Steel Flanged Beam

1. **Results**

Compare actual vs. expected values for elastic modulus of each beam. A table is a good way to summarize results if applicable.

Discuss the unknown beam and what your best guess as to what the material is. If your answer seems an unlikely then suggest further testing should be conducted.

1. **Discussion Questions**

Answer the questions asked in the lab procedure

1. Identify the impact of the various materials and shape configurations (How is a box beam different from a rectangular beam? How does aluminum vs. copper affect deflection? Etc.)
2. Discuss the difference between measured and theoretical deflection values (% error)
3. The mathematical definition for Area Moment of Inertia is I = ∫ y2 \* dA .

Based on your experimental work in beam bending, give a qualitative definition or explanation for the Area Moment of Inertia.

1. If you needed to reduce deflection in a loaded aluminum rectangular box beam in your structural design, which of the following variable(s) would you INCREASE? Which would be the MOST effective in reducing deflection? Assume W and T are outside dimensions and w and t are inside dimensions of a hollow box beam. L is the unsupported length.

L W w t T

1. What is the E value of the unknown material? What material do you suspect it to be?
2. For question 2 above, what material could you substitute for aluminum in your design to decrease the deflection? Why?
3. The mathematical definition for the Modulus of Elasticity or Young’s Modulus is E = Stress / strain. Based on your experimental work in beam bending, give a qualitative definition or description for the Young's Modulus or the Modulus of Elasticity.
4. Which has the larger Area Moment of Inertia, a 2” x 2” square beam of high strength stainless steel or a 2” x 2” square beam of balsa wood? Support your answer qualitatively or quantitatively.
5. Should the Elastic modulus of a beam change if the unsupported length of the beam is changed? Why?
6. What would be the percent change in deflection if a solid rectangular beam has its unsupported length changed from 30 inches to 36 inches? SHOW YOUR CALCULATION. What does this tell you about the importance of unsupported beam length in structural design?
7. Is the Modulus of Elasticity indicative of what the failure load of a beam would be? Why?
8. Which has a higher resistance to deflection (that is, a smaller ratio of deflection/F which is the slope on your graph), a solid square, 1”x1” beam, or a square box beam with outer dimensions of 1”x1” and inner dimensions of 0.95”x0.95”? (Assume that L and E are the same for both.) What advantages are there to using the box beam instead of the solid beam?
9. In how many significant figures do you think the final value of the modulus of elasticity

for each of the beams should be reported? Why?

1. **Conclusion**

Develop conclusions from the results obtained in the Beam Bending Lab.

The conclusion discusses your results and does not include statements like ‘This lab was useful to teach me about beam bending’.

Here are some suggestions:

1. What were your observations in the lab?
2. You can add suggestions for the lab
3. Say how good was this set up as a measurement of Young’s modulus by looking at the %error and say if you could be confident of the identification of the unknown material.
4. If you were not confident that you could clearly identify the unknown metal what other tests might you recommend might be included in the conclusions.