**SolidWorks Simulations: Structural Analysis**

**Lab Worksheet**

**Team Letter:** \_\_\_\_\_\_\_\_\_\_\_\_

**Team Members:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. Insert a screenshot of the simulation setup in the SolidWorks environment with all boundary conditions applied and mesh visible. Ensure that your screenshot depicts the location of the fixed boundary condition, the location and direction of force applied to the beam, and the mesh generated on the beam. **You do not need to have different screenshots for each material.**

Shape

Description automatically generated

1. Insert a screenshot of the “Displacement1” plot after successfully running the simulation. Ensure that the screenshot shows both the legend and the deflected beam. **You do not need to have different screenshots for each material.**

Shape, arrow

Description automatically generated

1. Fill in the table below with the **simulated** deflection values for each material tested in the lab procedure.

Table 1: Simulated Deflection Values for Each Material

|  |  |
| --- | --- |
| **Material** | **Deflection – δy (inches)** |
| Steel | 8.58214e-02 |
| Copper | 1.47551e-01 |
| Aluminum | 2.35446e-01 |

1. Given the measured experimental deflection values measured in the ENGR 1181 Beam Bending Lab provided below, calculate the percent difference compared to the value obtained in the SolidWorks simulations. **Include one sample calculation below using Equation 1.**

Table 2: Deflection Values for Each Simulation

|  |  |  |
| --- | --- | --- |
| **Material** | **Experimental Deflection (δy)**  **(inches)** | **% Difference** |
| Steel | 0.072 | 17.5152% |
| Copper | 0.148 | 0.303839% |
| Aluminum | 0.251 | 6.39495% |

(1)

1. Comment on the percent difference calculated for each material and discuss any potential sources of error.

The steel and aluminum could have their large error in how the computer calculated the bend due to the file being much older than the current version of SolidWorks. It is possible that they updated values of materials or the way they calculate these values for the bends. Copper however has a very small amount of error, and this could simply be due to differences between computers and the way that different processors are made to operate.

1. Explain two benefits of computer simulations compared to physical experiments*.*

Computer simulations are much quicker to perform, as well as cheaper for small companies and relatively consistent across multiple runs of a test.

1. Explain two benefits of physical experiments compared to computer simulations.

Physical experiments can show the user how real-world variables can affect the results of a test. This also makes the inconsistencies between tests a positive as it can show how something like a bridge will react to various weathers and wind speeds.