**MATLAB Final Project**

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1. Part A was done by first importing the excel file (01.xlsx) into MATLAB using the ‘xlsread’ command. The next step was running a simple plotting function on all five sheets of the file, getting all of the data on a chart, making sure to include legends and labels.



1. In part B the toughness was found by estimating the area under the cure of the plotted data from part A. This was done by using the ‘trapz’ command in MATLAB.

Results from this step in increasing order of toughness: material 3, material 2, material 1, material 5, and material 4.

1. Part C was performed to calculate Young Modulus, the slope of the stress-strain curve for a linear part of the curve, for the given materials. These values were calculated at values of 0.2, 0.5, and 0.7%. To do this for loops were first created to find the location of the values. Then using the Central Finite-Difference Formula the values were calculated.

Results are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **0.2%** | **0.5%** | **0.7%** |
| **Material 1** | 5.4643 | 34.1555 | 43.4338 |
| **Material 2** | 17.7453 | 41.5776 | 36.4693 |
| **Material 3** | 30.4174 | 29.7586 | 47.3954 |
| **Material 4** | 1.5237 | 24.6907 | 57.9482 |
| **Material 5** | 60.2270 | 23.7120 | 40.4631 |

1. In Part D the data found in the previous steps was fit to two different hyperplastic models, Ogden model and Mooney-Rivlin model. This was completed by first filtering the data to the point where maximum stress happened. Then using the ‘fminsearch’ command in MATLAB, the constants for Ogden, mu and alpha, as well as the constants for Mooney-Rivlin, C01 and C10, were solved for. Once this was complete these results were compared using coefficient of determination to determine which model best described the stress-strain behavior for each material.

The results are as follows: The Ogden model described materials 1 and 5 the best, whereas Mooney-Rivlin model described materials 2, 3, 4 the best.