Instructions:

* Replace the highlighted areas in yellow above with your own name, section and group numbers and correct dates,
* Watch the corresponding lab demo videos, review related materials in lecture notes, lab manual and other related documents,
* Provide your best answers to the following questions. Add pages as needed,
* Convert this Word answer sheet into pdf format and submit to Canvas.

1. (7 points) You were introduced to the concept of calibration. Provide your own account what it is in general.
2. Continuing from Question 1, we will perform a calibration procedure through the compliance test in this lab. Again, in your own words, describe how it is done (5 pts), explain how does it work (5 pts) and how will it be used in this lab (5 pts).
3. We will measure three sets of strain data for tensile test in this lab. What are the sources (6 pts)? Describe the experimental procedures to obtain each of the data sets (12 pts).
4. What measurement(s) require the use of “gage length” in the tensile test (4 pts)? Define “gage length” for the individual measurement (6 pts).

Total 50 points

Answers:

1. Calibration is to eliminate unwanted data measured by machinery that might affect our result. In our lab, there is an unwanted “system” elongation caused mainly by stretch of grip which will be measured together with the desired data, so we need to calibrate our equipment and remove this unwanted data.
2. To calibrate this unwanted “system” elongation (Lg), we will conduct a simple trick to discover its value. The procedure is to separately test a “rigid body” such as a thicker and much stiffer block (which elongation will almost not occur) under the same condition as our specimen is subjected to. Thus, the measured elongation would be approximately Lg. Then, after testing our specimen, we can simply subtract Lg from the measured elongation to find the actual elongation.
3. The sources are the dual-column Instron test system, the strain ages attached to the specimen, and the video extensometer. Experimental procedures:
   1. Connect specimen wires to the lead wires of P3 strain reader (red to red and black to black).
   2. Try to bend the specimen a little bit and compare the readout with the one obtained in the bending test.
   3. Connect the P3 strain reader to the computer using the USB cable. The overall control panel and a display window showing the strain reading will open. Move these two new windows to the leftmost edge of the screen.
   4. Turn the Instron test system on. Find the tensile test method file in the AerE 322\method subfolder on the desktop and start the Bluehill Universal software. Turn on the video extensometer. Once the Bluehill software open, place it on the right side of the screen to the visual space with the other two windows previously opened.
   5. Double check the travel limits which are set the same as in the compliance test.
   6. Fit the specimen into the side-action grips: centerline aligned, and all edges flushed.
   7. Roll up the “fine position” dial a few clicks to preload about 50-100lbs tension load to make the specimen straight and tight with minimal wiggle room in the middle of specimen around the gage.
   8. Measure the gage length between the edges of top and bottom grips.
   9. On the second Bluehill screen, enter the name of the data output. The default location is AerE 322\strain gage tensile test output subfolder on desktop.
   10. Click on the Select File button on the P3-D4 control panel and enter the name for the strain gage output file. You should set the file location same as the Instron output file to AerE 322\strain gage tensile test output subfolder on desktop.
   11. On the third Bluehill screen, click on the L-shape ruler icon after you confirm that you see a green line box encloses the two fiducial marks and each of them is enclosed by a small red line box. The value of the axial gage length will pop up.
   12. Click Balance All to zero out the elongation, load, and video strain.
   13. To balance the strain gage in the P3-D4 software, first toggle off Real Time Display under Hardware menu. Click into the setting control panel, review to see if the settings are all correct. Then click Zero button near the bottom left and click Ok to exit the setting control panel.
   14. If everything is ready at this point, first click Record button in the P3-D4 overall control panel to start taking strain gage measurements, then right away click the Start button on Bluehill screen to start the tensile test. Immediately click the Close Capture button in P3-D4 panel to stop the strain gage measurements and generate the strain gage output once 300 lbs load is reached. f the scales of the two graphs in Bluehill screen are off, click on the cross-arrow buttons on top of the graphs to rescale them. Finally, click on the endzone flag icon in Bluehill screen to end the tensile test and to produce the Instron output file.
   15. Bluehill software will prompt for another run, just click No to end it. Also select Exit under the File menu in P3-D4 panel to end the P3-D4 software.
4. We need the gage length to later convert the measured elongation into strain (the elongation is measured by the Instron test system). The gage length is the distance between the edges of top and bottom grips.