

**EXAM 1 – COMPUTER PORTION**

Put all of your code in one script and name it `lastname_firstname.m` (all lower case). Include your name, section number, and CM number in the header section of your code. **There should be no output other than what is requested.**

**Problem (52 pts)**

For this exam problem, we will work with the Excel file `tank.xls` posted on the course website. The file contains data for the water level over time in a draining tank as well as results from a model of the tank-draining process. Time (in seconds) is recorded in the first column, and the water level data (in inches) is stored in the second column. The third column contains the model results (in inches).

- (20 points) Download the Excel file from the course website. Load the contents of the file into MATLAB. **Do not** hard code the dimensions of the loaded array. Plot the water level data over time using **just circle markers** (no line). On the same graph, plot the model results over time as a solid line. Add a legend, a title, and good axis labels (with units).
- (18 points) You should notice that the provided model claims that the tank continues to drain once the water level reaches 2 inches, which is not true according to the data! Generate a new model results vector that corrects the unrealistic behavior of the given model by replacing all water level values that are below 2 inches with a value of 2 inches. Add code to your script to make a **new figure** (i.e., **do not** overwrite your first graph). Plot the data (using circle markers with no line) and the corrected model results (as a solid line) over time on a single graph. Add good labels and a good title. Remember to include a legend and units.
- (14 points) Add code to your script to calculate a single error quantity called the *standard error of the estimate* (or the SEE):

$$SEE = \sqrt{\frac{1}{n-2} \cdot \sum_{i=1}^n (h_{\text{model},i} - h_{\text{data},i})^2}$$

where  $h_{\text{model},i}$  is the  $i$ th value in the **corrected** model results vector,  $h_{\text{data},i}$  is the  $i$ th value of the data, and  $n$  is the number of data points. Print your SEE result to the **Command Window** using the following words:

The SEE value is x.xxxx inches.

Here, `x.xxxx` is your result, which must be printed using the specified format and a variable. (That is, **do not** just look at the result and type it into the `fprintf` statement.)

When you are finished, put your script (`lastname_firstname.m`) in the Moodle assignment dropbox.

**NOTE:** All programming must stop 5 minutes before the end of the period. You will have 5 minutes after that to post your file to Moodle if you need that time.