Armstrong State University
Engineering Studies
MATLAB Marina – File Input and Output Exercises

1. Answer the following questions for file input and output:
   a) What is file input typically used for?
   b) What is file output typically used for?
   c) What is a text file?
   d) What is a binary file? Give a few examples of binary files.
2. Write a MATLAB program to evaluate the function $f(t) = 4.5 - 4.2\cos(15\pi t)e^{-50t}$ over the time range $0 \le t \le 0.25$ seconds. Plot the function for the full time range $0 \le t \le 0.25$ seconds and the time range $0 \le t \le 0.1$ seconds. Once the program has been tested and verified working, add code to your program save your workspace variables in the file `functiondata.mat`.
3. Write a MATLAB program that loads the workspace variables saved in the file `functiondata.mat` and recreates the same plots generated for Problem 2 from the saved workspace variables. Make sure your program begins with the lines `clear`, `clc`, and `close all`, to ensure the workspace is empty before restoring workspace variables from the MATLAB file. How can you determine what variables were saved in a `.mat` file?
4. Write a MATLAB program to load the column header and numeric data from the text file `flowdata.txt`. Plot the flow data (height versus flow) and use the column headers as the x and y axis labels of the plot. Hints: Open and view the text file using a text editor such as Notepad to see the file format. The first column of data in `flowdata.txt` corresponds to the height in feet and the second column to the flow in feet cubed per second. Use the MATLAB `importdata` function rather than `dlmread` to read in the file data since the file has text strings. The column headers will come in as a cell array and the numeric data as a 2-D numeric array. Once the program has been tested and verified working, add code to your program save only the numeric data in a delimited text file named `flowdatanumeric.txt`. Open the file created using Notepad or a similar text editor to verify that the file write was successful.
5. Write a MATLAB program to evaluate the function $f(t) = 4.5 - 4.2\cos(15\pi t)e^{-50t}$ over the time range $0 \le t \le 0.25$ seconds and save the t and f data in both a comma delimited text file named `functiondata.dat` and a Microsoft Excel file named `functiondata.xls`. The data should be saved with t in the first column and f in the second column. Each column of data in the Microsoft Excel file should have an appropriate column header. The text file data does not need to have column headers (writing string data to a text file using MATLAB cannot be done using `dlmwrite` and requires the use of `fopen`, `fprintf`, and `fclose`).
6. Write a MATLAB program to load the column header and numeric data from the excel file `flowdata.xlsx`. Plot the flow data (height versus flow) and use the column headers as the x and y axis labels of the plot. Hints: Open and view the Excel file using Microsoft Excel to see the file format and the cell ranges of the data and headers. You may want to use the

versions of `xlsread` that allow one to specify the worksheet and range that data is read from or written to. See MATLAB's help for the details of `xlsread`.

7. Write a MATLAB program that will save the data contained in a `workerData` structure array in a Microsoft Excel file. The data should be saved with each worker's data stored in two columns thus for the `workerData` structure array of Figure 1, the data will require eight columns. The worker's name should be at the top of the first of the two columns corresponding to the data for that worker. The MATLAB code segment of Figure 1 can be used to create the 1 by 4 `workerData` structure array. Hint: the time and quality data for each worker are not the same length so for this problem using multiple file writes (one for each element in the `workerData` structure array, four total) is easier than determining the size of largest time/quality arrays, creating a 2D cell array large enough for largest time/quality arrays, and populating the cell array leaving empty cells for the shorter time/quality arrays so that the data could be saved using a single file write.

```
% create four workerData structures
workerData(1).name = 'Bob';
workerData(1).time = [15.7, 12.2, 16.0, 14.8, 19.5, 9.8, 10.1,
20.2];
workerData(1).quality = [true, false, true, true, true, true,
false, true];
workerData(2).name = 'Joe';
workerData(2).time = [18.7, 19.9, 23.4, 18.0, 18.7, 20.0];
workerData(2).quality = [false, true, true, false, true,
false];
workerData(3).name = 'Bernard';
workerData(3).time = [14.8, 16.6, 15.8, 17.3, 13.9, 18.0,
14.0];
workerData(3).quality = [true, true, true, false, true, true,
true];
workerData(4).name = 'Mike';
workerData(4).time = [19.8, 14.6, 18.8, 17.0, 15.1, 16.2];
workerData(4).quality = [true, true, true, true, false, true];
```

Figure 1, MATLAB Code to Create `workerData` Structure Array.

Last modified Thursday, November 13, 2014