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 (we are section 01), and CM number in the header section of your code. **There should be no output other than what is requested**.

Problem (50 pts)

For this exam problem, we will work with the Excel file `earthquake_data.xls` posted on the course Moodle page. The file contains the ground accelerations associated with the Dec 22, 2003 earthquake with an epicenter at San Simeon, CA. (The data is actually for the USGS measurement station in San Luis Obispo, about 40 miles from the epicenter.) The first column contains time samples of the east-west horizontal ground acceleration, the second column contains the north-south horizontal ground acceleration, and the third column contains the vertical ground acceleration. The time samples are recorded every 0.005 seconds and the first sample is at time 0. The accelerations are in cm/s^2.

a) (10 points) Download the Excel file from the Moodle page. Load the contents of the file into MATLAB. **Do not** hard code the dimensions of the loaded array. Plot the vertical ground acceleration data as a function of time. Add good axis labels and a title. Set the axis range using the command

```
axis([0 77 -50 50])
```

b) (5 points) Print, to the **command window**, the value of the maximum (positive) acceleration using the following format:

```
The maximum acceleration is XX.XX cm/s^2
```

c) (10 points) Add code to your script to create a *new* vector that contains only the acceleration sample values whose absolute value is larger than 20. This vector should be the same length as your original vertical acceleration vector, but where the acceleration is large it will have nonzero values and where the acceleration is small it will have zeros. Create a new figure, and plot this new vector as a function of time, using dot symbols `'.'`. Give the graph good axis labels and a title. Set the axis range to be the same as before.

d) (25 points) For this part, you will start from the complete vertical ground acceleration data from part (a). Use a 51 point moving average filter (as in the project) to create a new, slightly smoother, acceleration vector. Create a new figure, and plot this new vector as a function of time. (You will notice that the amplitude is quite a bit lower for the filtered curve, especially near the points identified in part (c).) Give the graph good axis labels and a title. Set the axis range to be the same as before. Print, to the **command window**, the value of the maximum (positive) filtered acceleration using the following format:

```
After filtering, the maximum acceleration is XX.XX cm/s^2
```

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.