Quiz 2

Date: March 29, 2012   Instructor: Trani

Honor Code Pledge

The information provided in this exam is my own work. I have not received information from another person while doing this exam.

Your Name _____

Your Signature _____

Write your solutions in a single Word file and **then create a PDF file**. Cut and Paste all your answers using screen captures. Show all your work. Label your file with your last name and CEE3804. Email your PDF file with solutions to vuela@vt.edu and tao81@vt.edu. In the email header use the words **CEE 3804 Quiz**.

Problem 1 (40 Points)

A Geotechnical engineer gives you a file with comma-delimited data on soil samples collected at three counties in Virginia. The data contains the following fields:

Column 1 = Soil sample (a sequence of letters and numbers)

Column 2 = County where sample was collected (the name of county is a string)

Column 3 = Soil sample California Bearing Ratio - CBR (dimensionless value between 0-100) - compares the stiffness of the soil compared to crushed stone which has a CBR value of 100.

A sample of the file is shown below.

Montgomery267334,Montgomery,13.91927865

Roanoke474683,Roanoke,16.47805669

Radford721316,Radford,17.2867411

Radford674358,Radford,12.61586975

Montgomery694735,Montgomery,16.88321812

Roanoke82912,Roanoke,14.46352245

Montgomery629851,Montgomery,18.71900252

a) Create a script in Matlab to read the data using the t**extscan** command.

b) Improve the script created in (a) to find the number of samples collected at each one of three counties: Montgomery, Radford and Roanoke.

c) Write code to save the numeric values of CBR for the samples collected at Montgomery County in a separate variable called CBR_Montgomery_County.

d) Plot a histogram of all the values of CBR for samples collected at Montgomery County. Label the histogram appropriately.

Problem 2 (30 Points)

A formula to estimate the noise generated by a subway is,

$$L_{eq} = K_{ref} + 10\log(N_{cars}) + 22\log\left[\frac{v}{32}\right] + 13\log(q)$$

where:

log is the base (10) logarithm which in Matlab is **log10**.

L_{eq} = equivalent noise level (decibels in scale A - dBA)

K_{ref} = reference sound exposure level (decibels - dBA)

N_{cars} = number of cars in the train

v = train speed (mph)

q = hourly average train volume (trains per hour)

a) Write a **Matlab script** to calculate the value of L_{eq} given values of v (speed), K_{ref} (sound exposure level), N_{cars} (train cars), and hourly train volume (q). The values of the four input variables are to be entered in the Matlab script as inputs.

b) Test your **Matlab script** of part (a) to estimate the values of L_{eq} using the following values: the train has 10 cars, the hourly train volume is 14 trains/hr and the reference sound exposure level value of 58 dBA. The speed of the train is a vector ranging from 10 to 60 mph.

c) Plot the speed (x-axis) vs. L_{eq} (y-axis).

Problem 3 (30 Points)

Table 1 contains the recommended size of gutter diameters and roof drainage areas for a rainfall intensity of 100 mm/hr. These values are used in the construction of houses to avoid water accumulation on the roof.

Roof Area Drained with Gutter Slopes (0.5%) (sq. meters)	Guttering Diameter (mm)
20	85
25	91
30	96
35	102
40	107
45	112
50	117
55	122
60	127
65	131
70	135
75	139

a) Create two vectors in Matlab that contain the data and plot. Just copy and paste the data if needed.

b) Use the interactive features of Matlab to find if a linear of quadratic relationship fits the data. Briefly explain.