

Quiz 2 (75 minutes)

Date: April 2, 2015

Instructor: Trani

Open book and notes, use of computer is allowed

Your Name _____

Pledge _____

Use a Word processor of your choice to assemble your solutions. Include all screen captures of your Matlab scripts and plots created as outputs. Include all tables for Problem 2 in your solution as well. Create a single PDF file and send via email to: Moises Bobadilla (moisesbm@vt.edu) and to me (vuela@vt.edu).

Problem 1 (30 Points)

Your task is to analyze asset data for a construction company. The data is presented in a separate file called "Construction_assets_Rev.xlsx". The data has the following information:

Construction Site	Vehicle	Miles	Value (\$)	Status
Salem	Cat 775F	98,345	123,450	Active
Galax	Cat 775F	112,340	179,642	Active
Richmond	Cat 725	172,645	118,900	Active
Galax	Cat 725	109,142	135,385	Active
Galax	Cat 775F	165,058	207,634	Active

Task 1

Create a Matlab script to read the data (do not use the manual Matlab import procedure here). In your script create variables to store the information in every column individually. In the script you should plot the miles traveled against the vehicle cost. Comment on the trend observed on the plot.

Task 2

Modify the script created in Task 1 to find all the vehicles of type Cat725 and then calculate the mean and standard deviation of the miles traveled by that type of vehicle only. Write the results to the Command Window.

Problem 2 (40 Points)

The following linear programming problem has been developed by a team in your company.

$$\text{Max } Z = 280x_1 + 180x_2$$

subject to:

$$x_2 \leq 1400$$

$$200x_1 + 350x_2 \leq 634000$$

$$x_1 \leq 2200$$

Task 1

Convert the problem shown above into standard form to be solved by hand using the Simplex Method. Write down the transformed equations and add slack and artificial variables as needed.

Task 2

Write the first two tables of the Simplex Method for this problem. Indicate the values of all the variables in every table. Indicate the value of the objective function Z in every table.

Problem 3 (30 Points)

A civil engineer is designing a rainstorm water management system for a new Virginia Tech parking lot. During a severe thunderstorm, the water runoff generated by the large parking lot is approximated using the following equation:

$$\text{runoff} = k_2 + k_1 \sin(t / k_3) e^{(-t/k_4)}$$

Where *runoff* is the runoff volume (cubic meters per second) generated by the parking lot, *t* is the time (in seconds) after the thunderstorm starts and k_1 through k_4 are parameters to calculate the runoff.

Task 1

Create a Matlab script to calculate the runoff for values of time *t* ranging from 0 to 4000. The value of the parameters k_1 through k_4 for a 100 year storm are:

```
k1 = 56;  
k2 = 1,25;  
k3 = 900;  
k4 = 375;
```

Task 2

Modify the Matlab script created in Task 1 and make a plot of the runoff as a function of time. Label accordingly. In your plot, make the markers of the plot red and the font size 20 for both axes.