CS4349 Advanced Algorithm Design and Analysis

Assignment 1 KEY:

Due back on: Friday, January 30, 2015 at 11:00pm.

The following is from syllabus:

No e-mail submissions are accepted. No late submissions are accepted. So, please plan accordingly, do not leave your submissions to the last minute. If you encounter a problem during elearning submission, please contact 24/7 elearning Help IMMEDIATELY. This help is available 24/7 at:

eLearning Help URL: http://www.utdallas.edu/elearning/eLearningHelpdesk.html
eLearning Help Phone: 1 866 588 3192

Any submission that is missed will be graded with a zero. Please do not insist for exceptions.

Purpose: Demonstrate the ability to use asymptotic notations, solve recurrences, and perform algorithm analysis.

Question 1 (30 POINTS): Given the input string "MERGESORTEXAMPLE", answer the following questions:

1.A.) (15 POINTS) Using the MergeSort algorithm provided in the course slides, illustrate the operation of MergeSort to **manually** sort this string. Please show each step of your recursive execution clearly.

1.B.) (15 POINTS) Perform a running time analysis (Θ only) of executing the MergeSort algorithm on this input. What will be the resulting running time? Please show your work.

Question 2. (40 POINTS): Implement the InsertionSort and MergeSort algorithms in any programming language you feel yourself comfortable. Then measure the runtime of each algorithm for integer arrays of size n=10, n=100, n=1000, n=10000, and n=100000 elements. Plot the input size vs. runtime graph for each algorithm for each size. You can plot the graph either manually, or by using an automated tool. Compare and comment on the results. Please attach your program code to your submission.

Hint: For the sake of easiness, you may randomly assign elements to the arrays.

Question 3. (30 POINTS) Write the pseudocode for **recursive** Binary Search algorithm. Analyze its running time (Θ only). Please show your work.

Naming Convention:

If you are submitting multiple files, please create a ZIP file of all your files and use the following naming convention for your ZIP file:
CS4349-Assignment<number>-<FirstName><LastName>.zip.

So, student John Smith will name his 1st assignment zip file as:

CS4349-Assignment1-JohnSmith.zip

If you are submitting a single file, please name your file as:

C4349-Assignment1-JohnSmith.doc or .pdf, etc.

Good luck.