CSCE 221 Cover Page

Homework Assignment #2

First Name Last Name UIN

User Name E-mail address

Please list all sources in the table below including web pages which you used to solve or implement the current homework. If you fail to cite sources you can get a lower number of points or even zero, read more on Aggie Honor System Office website: `http://aggiehonor.tamu.edu/`

Type of sources				
People				
Web pages (provide URL)				
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I certify that I have listed all the sources that I used to develop the solutions/codes in the submitted work. *On my honor as an Aggie, I have neither given nor received any unauthorized help on this academic work.*

Your Name Date

Homework 2

due October 18 at 11:59 pm.

1. (20 points) Linked list questions.

   (a) Write a recursive function in C++ that counts the number of nodes in a singly linked list.

   (b) Write a recurrence relation that represents the running time for your algorithm.

   (c) Solve this relation and provide the classification of the algorithm using the Big-O asymptotic notation.

2. (20 points) Write a recursive function that finds the maximum value in an array of int values without using any loops.

(a) Write a recurrence relation that represents running time of your algorithm.

(b) Solve this relation and classify the algorithm using the Big-O asymptotic notation.

3. (10 points) What data structure is the most suitable to determine if a string is a palindrome? A string is a palindrome if it is equal to its reverse. For example, "racecar" and "so many dynamos" are palindromes (spaces are removed from many word strings). Justify your answer. Use Big-O notation to classify the running time of your algorithm.

4. (10 points) Solve C-5.2 on p. 224

5. (20 points) What is the amortized cost of the stack push operation when the additional stack-array memory is allocated by each of these two strategies? Do calculations to support your answer.

   (a) Doubling strategy – double the size of the stack-array memory if more memory is needed.

   (b) Incremental strategy – increase the size of the stack-array by a positive constant c if more memory is needed.

6. (10 points) Describe (in pseudo code) how to implement the stack ADT using two queues. What is the running time of the push and pop functions in this implementation?

7. (10 points) Solve C-5.8 on p. 224

8. (20 points) Consider the quick sort algorithm.

   (a) Provide an example of the inputs and the values of the pivot point for the best, worst and average cases for the quick sort.

   (b) Write a recursive relation for running time function and its solution for each case.

9. (15 points) Consider the merge sort algorithm.

   (a) Write a recurrence relation for running time function for the merge sort.

   (b) Use two methods to solve the recurrence relation.

   (c) What is the best, worst and average running time of the merge sort algorithm? Justify your answer.