**Data Structures (2028C) – Spring 2018 – Homework 4**

***Topics covered: Heaps and Priority Queues***

*Homework due:* ***Friday, April 20 at 1:25PM***

**Objective:**

The objective of this Assignment is to create an implementation of a Heap and a Priority Queue.

**Task 1:**

1. Create an implementation of a Priory queue using a sorted linked list class. Include the following members:
   1. Insert – This will add an item to the queue in the appropriate location.
   2. Remove – This will remove an item from the queue from the appropriate location.
   3. PrintQueue – This will print the items in the queue in priority order.
2. Create a menu for testing the queue.
3. In the report, discuss the advantages and disadvantages of this structure over a standard queue.

**Task 2:**

1. Create an implementation of a Heap using a class. Include the following members:
   1. Insert – This will add an item to the queue in the appropriate location.
   2. Remove – This will remove an item from the queue from the appropriate location.
   3. PrintHeap – This will print the items in the heap in priority order.
2. Create a menu for testing the Heap.
3. In the report, discuss the advantages and disadvantages of this structure over a standard binary search tree.

**Task 3:**

1. Evaluate the performance of adding 500, 1,000, 2,000, and 5,000 random items to each of the structures built in task 1 and 2 using the same techniques as the sorting lab. Make sure the items being added are the same for each of the structures. In the report, graph the results and discuss the performance of each structure compared to the expected performance from Big O notation.
2. Evaluate the performance of removing all of the items from step 1 for each of the 4 sets of data (remove 1 at a time, not all at once). Make sure the items being added are the same for each of the structures. In the report, graph the results and discuss the performance of each structure compared to the expected performance from Big O notation.

**Assignment Submission:**

1. Write a report including the following information:
   1. A description of the objectives/concepts explored in this assignment including why you think they are important to this course and a career in Engineering.
   2. A demonstration of the output of your testing.
2. Include all source code from all tasks, input and output files (if any), and any special instructions to compile and run those programs.
3. Package all files in a single zip folder and submit the file as a group via Blackboard. Make sure all group member’s names are on the report.

**Assignment Grading:**

1. 20% - Task 1 has been correctly implemented.
2. 30% - Task 2 has been correctly implemented.
3. 25% - Task 3 has been correctly implemented.
4. 25% - Report contains all required information and is well written.

If program fails to compile, 0% will be given for that Task.