**CSCI 301 Moustafa Elsayed**

**Computer Science 2**

**Project 7: IMPLEMENTING RADIX SORT**

**Introduction**

Queues are ADT that work similarly to stacks but differ in how they sort their data, unlike the stacks, queues store their data by making the first data that is inserted is the first data to be removed. This program uses queues in order to store randomly generated numbers that are sorted in ascending order, then print them in the same order when called for in the terminal.

**Data Structures**

There are 11 data structures that are used in this program:

* An Item type in the header file “data”: This is used to store integers in the queue ADT.
* An int type “front” in the header file: This is used to indicate the first value of the queue ADT.
* An int type “rear” in the header file: This is used to indicate the last value of the queue ADT.
* An int type “size” in the main file: This is used to hold the value of the number of the integers in the array.
* An int type “seed” in the main file: This is used to hold the value of the seed value that is used to generate random numbers.
* An int type “max” in the main file: This is used to hold the value of the largest randomly generated integer in the array.
* An int type “digitCount” in the main file: This is used to hold the number of digits from the returned value of the digitNum() function.
* An int type array “arr” in the main file: This is used to hold the randomly generated numbers.
* An int type “count” in the main file: This is used to hold the amount of digits in an integer in the digitNum() function.
* An int type “max” in the header file: This is used in the function findMax(), it holds the value of the largest integer in the array.
* An int type “nth” in the main file: This is used in the function radixSort(), it indicates which nth digits is the program comparing.

**Functions**

This program uses 7 functions:

* Int size (): This function returns the size of the queue ADT.
* Bool empty(): This function returns whether or not the queue ADT is empty.
* Void enqueue(): This function add an integer to the queue ADT.
* Int dequeue(): This function returns the first added integer in the queue ADT.
* Int digitNum(): This function return the number of digits in the input integer.
* Int findMax(): This function return the largest integer in the array.
* Void radixSort(): This function sorts the array from smallest to largest integer.

**The main Program**

The program first asks the number of integers to make and the seed value to base these randomly generated integer from. Then the program uses the seed to generate that many integers and stores then in an array. The program finds the largest integer in the array using the findMax() function and then finds the number of digits within that integer using the digitNum() function. Then the program uses the radixSort() to sort these integer from smallest to largest integer and stores then in the queue ADT. Finally the program prints these integers in that same orders using a friend function.