CSCE 221 Assignment 3 Cover Page

First Name Suqian Last Name Wang UIN 825009505

User Name wangsuqian123 E-mail address wangsuqian123@tamu.edu

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	lecture sides			
People	Teresa Leyk			
Web pages (provide URL)				
Printed material				
Other Sources				

I certify that I have listed all the sources that I used to develop the solutions/codes to the submitted work.
On my honor as an Aggie, I have neither given nor received any unauthorized help on this academic work.

Your Name Suqian Wang Date July 29th, 2017

CSCE 221 Assignment 3
Summer 2017

1. **Linked list implementation**

   Queue implement with doubly linked list:

   > Minqueue is a class with two private member, a template doubly linked list and its size. Queue is a first in and last out data structure. The queue stores the comparable elements that support the following operations: enqueue which adds an new element at the tail of the doubly linked list, dequeue which deletes the first element of the doubly linked list and returns its value, size which returns the number of elements in the doubly linked list, isEmpty which checks if the queue is empty, and getMin which finds the smallest value in the queue.

2. **Complexity analysis**

   isEmpty O(1) - using the isEmpty function implemented in the template doubly linked list which only takes constant time

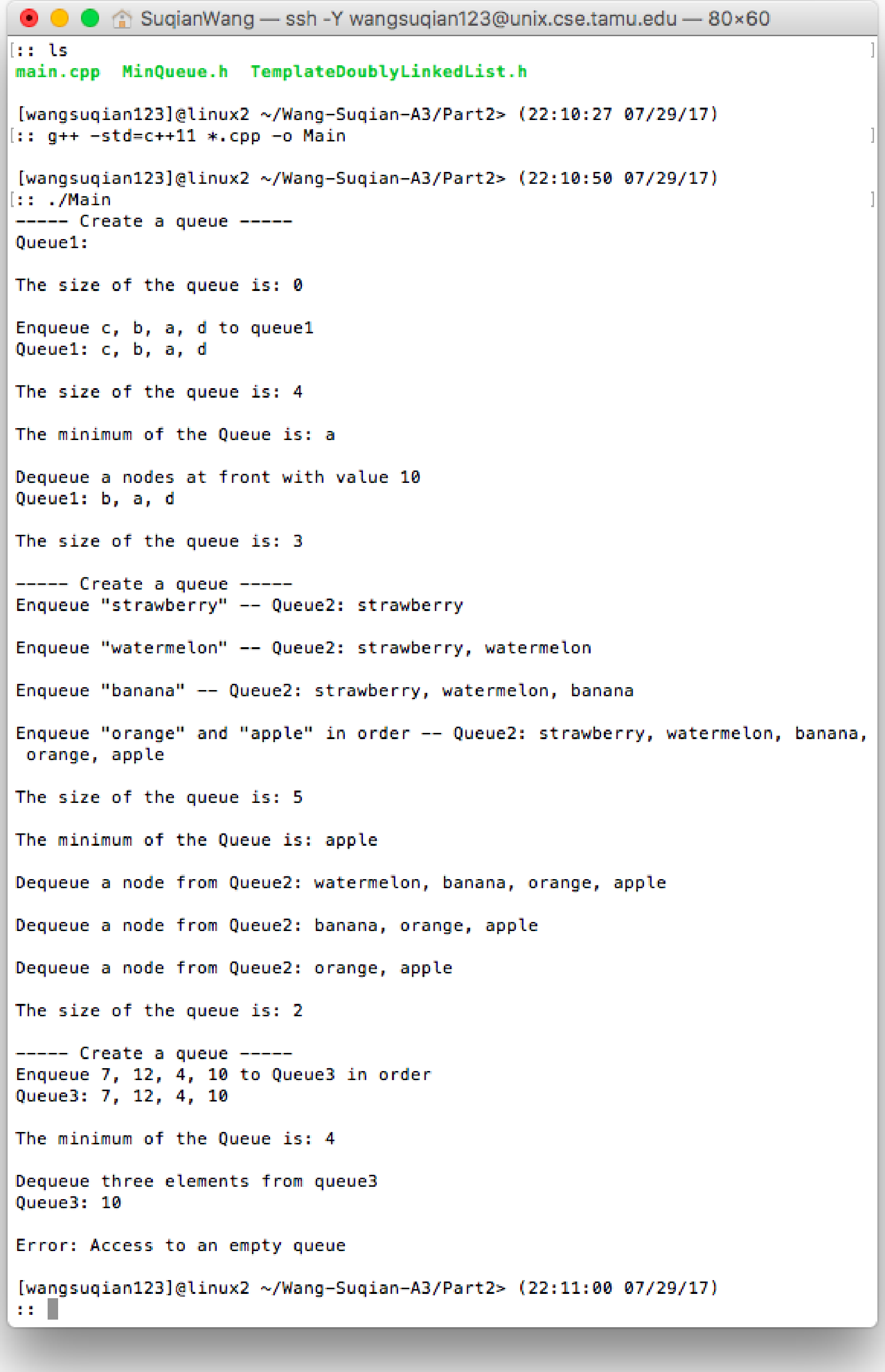
   size O(1) - return the value of its private member: queueSize

   enqueue O(1) - add a node at the back of the list, using the insertLast function implemented in the template doubly linked list which takes constant time, increasing the queueSize after inserting takes constant time also.

   dequeue O(1) - remove the node at the front of the list, using the removeFirst implemented in the template doubly linked list which takes constant time, decreasing the queueSize before removing

   getMin O(n) - create a new node and initialize it with the first element, travese the queue and compare each element with the current node with the minimum value, swap if necessary, since we need to traverse the queue and compare, the time complexity is O(n).

3. **Testing results**



```
[:: ls
main.cpp  MinQueue.h  TemplateDoublyLinkedList.h

[wangsuqian123]@linux2 ~/Wang-Suqian-A3/Part2> (22:10:27 07/29/17)
[:: g++ -std=c++11 *.cpp -o Main

[wangsuqian123]@linux2 ~/Wang-Suqian-A3/Part2> (22:10:50 07/29/17)
[:: ./Main
----- Create a queue -----
Queue1:

The size of the queue is: 0

Enqueue c, b, a, d to queue1
Queue1: c, b, a, d

The size of the queue is: 4

The minimum of the Queue is: a

Dequeue a nodes at front with value 10
Queue1: b, a, d

The size of the queue is: 3

----- Create a queue -----
Enqueue "strawberry" -- Queue2: strawberry

Enqueue "watermelon" -- Queue2: strawberry, watermelon

Enqueue "banana" -- Queue2: strawberry, watermelon, banana

Enqueue "orange" and "apple" in order -- Queue2: strawberry, watermelon, banana,
 orange, apple

The size of the queue is: 5

The minimum of the Queue is: apple

Dequeue a node from Queue2: watermelon, banana, orange, apple

Dequeue a node from Queue2: banana, orange, apple

Dequeue a node from Queue2: orange, apple

The size of the queue is: 2

----- Create a queue -----
Enqueue 7, 12, 4, 10 to Queue3 in order
Queue3: 7, 12, 4, 10

The minimum of the Queue is: 4

Dequeue three elements from queue3
Queue3: 10

Error: Access to an empty queue

[wangsuqian123]@linux2 ~/Wang-Suqian-A3/Part2> (22:11:00 07/29/17)
::
```