Lab 8: Linked Lists

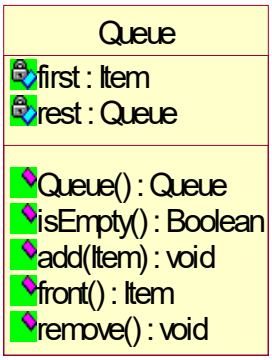
Aim

This lab class gives you an opportunity to:

- implement a program that manipulates singly linked-lists; and
- experiment with the Queue ADT.

Context

A *Queue* is a first-in-first-out data structure in which items are removed in the order they are added: the first item in is the first item out, the last item in is the last item out. The UML diagram for the ADT is:



The constructor/initialiser creates an empty queue. `isEmpty()` examines the queue and indicates whether there are any items present in the linked-list (returning `true` if not, and `false` if so), `add()` adds the specified item (to be implemented as a value of type `void *`) to the rear of the linked-list, `front()` returns the item at the front of the queue without altering the queue, `rear()` — called "remove" in the above diagram — discards the front item from the queue, and `toString()` returns the contents of the queue as a string (and needs to be given a format string to assist with the conversion). The program should exit with return value 1 if the queue is empty when `front()` or `rear()` is attempted.

Tasks

1. The compressed project folder (`Lab8.zip`) should be obtained from MyLO and all contents extracted to your home directory. Open the project folder and open the project file (`Lab8.sln`).
2. Inspect `node.h` and `queue.h` to see what functions are required.
3. Complete the implementation of `node.c` and `queue.c`. (You may like to draw diagrams to help you develop the code for your functions. You may also like to examine `stack.c` and §7 from lectures.)
4. Compile and execute the project. Because the random number generator is not seeded, you should see the results below:

```
Adding 2 students...[018467] [006334] done.
Queue is <018467, 006334>
Queue is empty? false
Front is 018467
Removing front item...done.
Front is now 006334
Queue is <006334>
```

5. Modify the `main()` function in the harness file (`Lab8.c`) to ensure the program exits whenever `front()` or `rear()` are called with an empty queue.