COMP 2011

Lab Four: Stacks and Queues (Total mark: 100)

Deadline: 23:59, 16 OCT. 2014

Goals: Understand stacks and queues, the two data structures we have learned.

1. Stacks can be used to help implement recursive functions. Given the java program stack.java, based on Class StackX, in Classs StackApp design a new function called fac() that can calculate the factorial of a number. The prototype of the function fac() is:

   public static long fac(long j)

   In the implementation, you CANNOT use recursion; instead, you MUST use the stack by pushing numbers onto the stack first and then popping up them for calculation (*In fact, recursive functions are executed in the similar manner*).

   In main(), call fac() with 2, 3, 4, 5, 20, and 21, respectively, and print the results. Is the result for 21 correct? Why?

2. Given the java program stack.java, based on Class StackX, design a new Class named Queue by **using the methods in Class StackX only**. The methods in Queue should include the **constructor** method, void **insert**(long), long **remove**(), and boolean **isEmpty**() as the queue we learned. Add Class QueueApp in the Java program related to Queues from the Blackboard to test your queue. Your Java program should be like:

```
class StackX
{
        //From the java program (stack.java) downloaded from the Blackboard
}

class Queue
{
        //Your implementation by using the methods from Stackx
}

Class QueueApp
{
        //From the java program (queue.java) downloaded from the Blackboard
}
```

   (Hint: you can use another stack to help implement the methods of a queue.)

   What to submit:
   (1) The report that records the outputs of your programs.
   (2) The java source code of your programs.