

# STiDC'10: Exercise 4

October 25, 2010

## 1 Problem 1

The *consensus number* of an object is the *maximum* number of processes for which any number of instances of the object, together with atomic MWMR registers, can solve consensus. Your task is to prove the following statements, based on what you have seen in class.

1. Prove that the consensus number of atomic registers is 1.
2. Prove that the consensus number of a compare-and-swap object is  $\infty$ .
3. Prove that the consensus number of a queue is 2. For this, you will have to prove that (a) a queue can implement consensus for two processes (already done in class), and (b) that it is impossible to implement a consensus object using only queues and atomic registers in a system of 3 processes. (This is slightly harder. Hint: try to re-do FLP. One of the references listed on the class website might help if you get stuck.)

## 2 Problem 2

Devise an algorithm that implements a consensus object using (any number of) queues that are *initially empty* (uninitialized) and atomic registers in a system of 2 processes.