

# **HY586: Distributed Computing**

## **Professor: Panagiota Fatourou**

### **Assignment 2**

**Deadline: Monday, 26/10/09, before class**

#### **Exercise 1**

Prove the generalized lemma (Lemma 4) in the proof of the lower bound on the number of shared r/w registers required by any mutual exclusion algorithm for  $n$  processes.

#### **Exercise 2**

- a. Prove that the order of lines 12 and 13 in the Black-White Bakery algorithm is crucial for correctness.
- b. The author of the Black-White Bakery Algorithm claims the following:  
“The color bit can be easily implemented using  $n$  single-writer atomic bits, one for each process. To change the color, process  $i$  changes the value of the  $i$ -th bit. Black corresponds to the case where the number of bits which are set to 1 is even, while white corresponds to the case where the number of bits set to 1 is odd.” Provide code for this new version of the algorithm and explain why the new algorithm is correct.
- c. Is the Black-White Bakery algorithm correct if the third clause of the second wait statement is removed?
- d. In the Black-White Bakery algorithm what would be the size of the entries of the number array if we replace the third line with the following line:  
 $\text{Number}[i] = 1 + \text{maximum}\{\text{Number}[0], \dots, \text{Number}[n-1]\}$