System and device programming
17 September 2012
Programming part

Time: 1h 45min. Textbooks and/or course material allowed.

(18 marks) The final mark is the sum of the 1st > 8 and the 2nd part > 10

The final mark cannot be refused, it will be registered (no retry for marks >= 18)

Write a C program using Pthreads to implement an election algorithm that elects a leader thread.

The main thread generates **`N>8`** threads with associated an integer rank value generated random (in the range **`1-N)`**, the threads loop doing noting but are ready to receive and handle a **`SIGUSR1`** signal.

The main thread decides to begin an election campaign at random times (in range 2-5 seconds). It selects randomly **`N-3`** threads and sends to them an election signal (**`SIGUSR1`**).

The threads **cannot communicate with the main thread**, and a thread **cannot access the rank value of other threads**, i.e., you cannot use a global array to store the rank value of the selected threads, you can keep in global variables only the identifier of the thread that has currently the best rank value, and its value (**`best_rank`**).

Each thread must compare its own rank value with the current value in **`best_rank`** to decide if it is the leader or not, but it must synchronize with all the other threads to be sure that they have updated the value of **`best_rank.`**

When each thread has obtained the rank value of the leader thread it simply prints:

- its identifier and its rank value,
- the leader thread identifier and its rank value.