System and device programming
25 June 2015

Examination Time: 1h 45min. Evaluation. 18 marks.
Textbooks and/or course material allowed.
The final mark is the sum of the 1st and the 2nd parts

Write a concurrent C program `concurrent_file_processing. c` in the Unix environment which takes from the command line an argument `n ,` which must be an even integer, and generates `n A_threads` and `n B_threads.`
These threads perform the same task, but belong to two different types.
The synchronization among the threads follows these specifications:

- The main thread generates all the other threads, then it terminates.
- All the threads run concurrently, and are not cyclic.
- Then `A_threads` are created with an associated identifier `(0 to n-1).`
- Then `B_threads` are created with an associated identifier `(0 to n-1).`
- Each thread sleeps a random number of seconds (max 3), then it is supposed to process a file identified by the thread identifier, but in our case it does nothing.
- When a pair of threads of type A has processed their "files", one of them (the last) must concatenate the two files. In our case it simply prints for example:

  A4 cats: A4 A8
- When a pair of threads of type B has processed their "files", one of them (the last) must concatenate the two file, in our case it simply prints for example:

  B5 cats B5 BO
- When a pair of A_threads and a pair of B_threads have completed their concatenate operation, one of them (the last) must combine the four file. In our case it simply prints for example:

  A1 merges A1 A4 B3 B4

This is an example of output for the command `concurrent_file_processing 12`

```
A9  cats    A9  A4
>B3 cats    B3  B1
                    B3 merges    B3  B1  A4  A9
A2  cats    A2  A10
B7  cats    B7  B6
                    B7 merges    B7  B6  A2  A10
B9  cats    B9  B8
A5  cats    A5  A3
                    A5 merges    A5  A3  B8  B9
A7  cats    A7  A6
All . cats All A8
BO  cats    BO  Bll
                    BO merges    BO  Bll A6 A7
B4  cats    B4  B2
                    B4 merges    B4  B2  ` ` All
BIO  cats   i BIO B5
AO  cats    AO  A1
                    AO merges    AO  Al  B5  BIO
```

Hint: Use an array of counters with one counter per each `A_thread.`
Use an array of counters with one counter per each `B_thread.`
Manage these counters to get your solution.