Politecnico di Milano – V Facoltà di Ingegneria
088924 – Tecnologie di middleware per sist. dist. (Ord. 270)
Prof. G. Cugola - February 25, 2011

Rules:
- **You are not allowed to use books, notes, or other material.**
- **You can answer in Italian or English.**
- **Total time for the test: 1.5 hour.**

1. Implement an `Executor` class in Java. The class provides a method to execute a job (i.e., a `Runnable`) after a given delay (in ms). Suppose the jobs to execute run in a very short time. Use a single thread to manage the schedule and to execute jobs. Use only the basic synchronization facilities provided by the language (i.e., do not use the "new" library classes for synchronization).

2. Describe the main (conceptual) differences between the point-to-point and the publish/subscribe domains in JMS.   ← Solved in JMS.pdf

3. Write in TinyOS the interface of a module to publish data (8 bit integer numbers) and to subscribe (i.e., be notified), when a specific value has been published.

4. Consider the following Erlang functions.

```erlang
-module(es).
-export([fun/0]).

fun() ->
    receive{S, V} ->
        S ! fun1(V),
        fun()
    end.

fun1([]) ->
    0;
fun1([H|T]) when H>0 ->
    H+fun1(T);
fun1([H|T]) ->
    fun1(T).
```

   a) What is the behavior of these functions? Describe in particular the following primitives: `receive, !, when`
   b) Is function `fun1` properly written? Describe possible problems in its implementation and fix them.