T-79.186 **Spring 2004**
Reactive Systems
Home Exercise 2
Deadline 18.2 16.15

Return your answers by email to Timo.Latvala@hut.fi, or on paper to the lecture.

For this home exercise round use the definition of automata as given by Chapter 1 of the book: Bérard et al: Systems and Software Verification.

1.) (a) Give an automata description $\mathcal{A}_3$ (without using variables) for a modulo 3 counter, which has the following actions: (i) *dec* decreases the value of the counter by one (mod 3), and (ii) *inc2* increases the value of the counter by two (mod 3). In the initial state of the automaton the value of the counter should be 0.

(b) Give another automaton $\mathcal{A}_4$, which is a modulo 4 counter, and also has the actions *dec* and *inc2*.

(c) Compute the synchronised product automaton $\mathcal{P} = \mathcal{A}_3 \times \mathcal{A}_4$ using the synchronisation set $Sync = \{(dec, inc2), (inc2, dec)\}$.

2) (a) In the book (Bérard et al., pages 21–23) an elevator system is described that is a synchronised product of five automata (3 doors, a cabin, and a controller). Give a partial execution of $\mathcal{P}$, which ends in any state where the controller is in the state **free2**.

Note that the book has the following off-by-one errors in the definition of the set *Sync* on page 23: the numbering of the doors should be from 0 to 2 instead from 1 to 3 as in the (faulty) definition of *Sync* in the book.

(b) Give the set of reachable states of Peterson's MUTEX-algorithm (Bérard et al., pages 25-26).