Prof. Dr. Ir. Joost-Pieter Katoen
apl. Prof. Dr. Thomas Noll
B. Kaminski, C. Matheja

Concurrency Theory WS 2015/2016

— Series 10 —

Hand in until February 1st before the exercise class.

Exercise 1 (k–Boundedness and Marking Graphs) (1.5 + 1.5 Points)

An elementary net N is k–bounded iff for each reachable marking M and place p of N holds

$$M(p) \;\le\; k\ .$$

Prove or disprove:

a) If N is k–bounded, then N has a finite marking graph.

b) If N has a finite marking graph, then N is k–bounded.

Exercise 2 (Regularity of Petri Net Languages) (1.5 + 1.5 Points)

Let $N = (P, T, F, M_0)$ be an elementary net and let $\mathsf{Lab}\colon T \to \Sigma$, where Σ is a finite alphabet, be a labelling of the transitions. The language of N is defined as

$$\mathcal{L}(N, \mathsf{Lab}) \;=\; \{w \in \Sigma^* \mid w = \mathsf{Lab}(t_1)\cdots\mathsf{Lab}(t_k),\, \sigma = t_1\cdots t_k,\, M_0 \xrightarrow{\sigma} M\}$$

A language L is called petri–net–acceptable iff there exist an elementary net N with labelling Lab such that $L = \mathcal{L}(N, \mathsf{Lab})$. Prove or disprove:

a) If L is regular, then L is petri–net–acceptable.

b) If L is petri–net–acceptable, then L is regular.

Exercise 3 (Dining Philosophers Revisited) (2 + 1 + 1 Points)

Reconsider the Dining Philosophers scenario from Exercise Series 4, Exercise 1.

a) Remodel this scenario as an elementary net. Your net's transition set shall contain at least the set

$$\{\mathsf{pickUpFork}, \mathsf{pickUpSpoon}, \mathsf{releaseFork}, \mathsf{releaseSpoon}, \mathsf{releaseFork}, \mathsf{eat}_1, \mathsf{eat}_2\}\ .$$

b) Draw the marking graph induced by your net.

c) Argue whether your net exhibits a deadlock situation.