Series 6 (27.10.2011)

Submission: **15:00, November, 3, 2011**, into the boxes next to the room I-21. Write every solution on the separate paper (format A4)! Don't forget to sign your solutions.

It is not sufficient to answer a single number or yes/not. Answers always have to be justified.

Let us define generalized NFA $(Q, \Sigma, \delta, Q_I, F)$, where Q, Σ, δ, F has the same meaning as for ordinary NFA. $Q_I \subseteq Q$ is nonempty set of initial states. Computation of an generalized NFA on x starts with configuration $(q, x), q \in Q_I$.

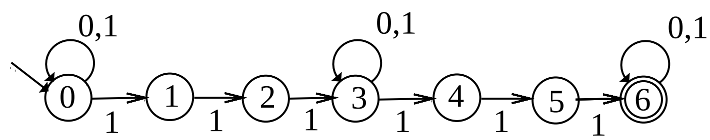
Exercise 1. Show that for every generalized NFA A' there exists equivalent ordinary NKA A, i.e. such that $L(A') = L(A)$.

For the generalized NFA A we have generalized subset construction of deterministc FA $\pi(A)$ (which contains only reachable states).

Operation revese assign to an deterministic FA $A = (Q, \Sigma, \delta, q_0, F)$ generalized NKA $\rho(A) = (Q, \Sigma, \rho(\delta), F, \{q_0\})$, we exchange initial and accepting states and $q \in \rho(\delta)(q', a) \Leftrightarrow \delta(q, a) = q'$ (arrows are reversed).

Exercise 2. Show that $A' = \pi(\rho(\pi(\rho(A))))$ is deterministic FA which is equivalent with A, i.e $L(A) = L(A')$. Automaton A' is minimal, i.e. any other deterministic FA B such that $L(B) = L(A)$ has at least so many states as has A'. (Bonus not compulsary exercise: Prove that A' is minimal.)

Exercise 3. For nondeterministic FA M



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a) using subset construction deterministic FA A.

b) For automaton A from the part a) construct (and draw) $\rho(A)$, $\pi(\rho(A))$, $\rho(\pi(\rho(A)))$ a $\pi(\rho(\pi(\rho(A))))$.