Series 4 (13.10.2011)

Submission: **15:00, October, 20, 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.

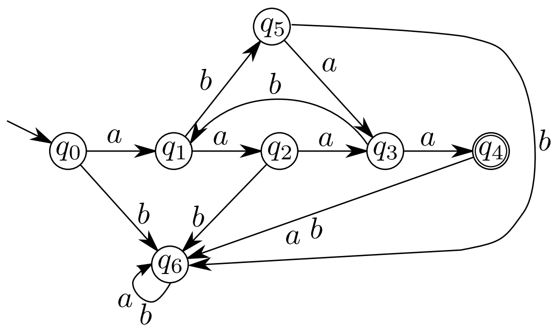
Exercise 1. Use modular construction (simulation methode) to design an automaton for the language

$$L = \{x \in \{0,1\}^* \mid x \text{ contains the subword } 0101 \text{ and has even number of } 1\}.$$

Experss L as intersection of two languages L_1, L_2. For each of them design an finite automaton. You have to prove that they are corerect, i.e. $L(A_1) = L_1$ and $L(A_2) = L_2$. Design the automaton A which will simulate both automatons A_1 and A_2.

Exercise 2. Find out which language is accepted by automaton and justify your claims

a)



b) $A = (\{a,b\}, \{q_0, q_1, q_2, q_3, q_4, q_5\}, \delta, q_0, \{q_5\})$, and $\delta(q_0, a) = q_1$, $\delta(q_0, b) = q_3$, $\delta(q_1, a) = q_2$, $\delta(q_1, b) = q_5$, $\delta(q_2, a) = q_0$, $\delta(q_2, b) = q_3$, $\delta(q_3, a) = q_3$, $\delta(q_3, b) = q_3$, $\delta(q_4, a) = q_3$, $\delta(q_4, b) = q_5$, $\delta(q_5, a) = q_3$, $\delta(q_5, b) = q_4$.

Exercise 3.

a) Prove that language $\{0^n 1^{2n} 0^{3n} \mid n \in N\}$ is not regular.

b) Prove that automaton which accepts language $\{aabax \mid x \in \{a,b\}^*\}$ has at least 4 states. (Hint: use lemma 3.12)