Series 2 (29.9.2011)

Submission: **15:00, October, 6, 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. Let Σ_1 and Σ_2 be two alphabets and h be the homomorphism from Σ_1 to Σ_2. How many different homoprphism h there exist,

a) if $|h(a)| \leq 2$ for all $a \in \Sigma_1$?

b) if $\forall a \in \Sigma_1 : (|h(a)| \leq 1$ and $\{a\} = h^{-1}(h(a)))$. You can asuume that $|\Sigma_1| \leq |\Sigma_2|$.

Exercise 2. Let h be homomorphism and L_1, L_2 arbitrary languages over the same alphabet. Prove or disprove folowing claims:

a) $h(L_1 \cap L_2) = h(L_1) \cap h(L_2)$,

b) $h^{-1}(L_1 \cup L_2) = h^{-1}(L_1) \cup h^{-1}(L_2)$,

c) $h^{-1}(L_1 \cap L_2) = h^{-1}(L_1) \cap h^{-1}(L_2)$.

Exercise 3. Exercise 2.42 from the book.