Mathematical Methods for Computer Science II

Spring 2021

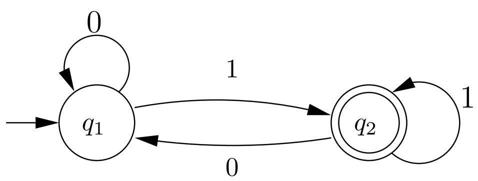
Series 8 – Hand in before Monday, 03.05.2021 - 12.00

1. Let M_i, $i = 1, 2, 3$, be ε-NFAs with a unique final state, and L_i be the language accepted by M_i. Using the algorithm given in the lecture, sketch an ε-NFA that accepts the language $(L_1 \cup L_2)L_3$ and an automaton that accepts the language $(L_1L_3) \cup (L_2L_3)$.

2. Let M be an ε-NFA with n states accepting a language L. Sketch an ε-NFA M' accepting the language $L(L^*)$ such that its number of states is also n. (In M' transitions from the final state are allowed.)

3. Let $(Q_i, \Sigma, \delta_i, q_i, F_i)$, $i = 1, 2$, be two DFAs accepting the languages L_1 and L_2, respectively. Let n_1 and n_2 be the number of states in the first and in the second automaton, respectively. Describe a DFA with $n_1 n_2$ states that accepts the language $L_1 \cup L_2$ and a DFA that accepts the language $L_1 \cap L_2$. In both cases, give a formal description of the set of states, of the transition function, and of the set of final states.

4. Find a regular expression for the language accepted by the automaton shown below.



5. Construct a regular expression for the language of all binary words with an even number of zeros and an even number of ones.