Homework 2
Com S 331, Spring 2017
Due date: **Monday, January 30, 2017**
Please submit the homework via BlackBoard **before the class that day**.

Note: All submissions should be .pdf or .doc(x) format. However, state diagrams can be drawn with hand and presented in the final manuscript as images. We recommend to use Latex for typing homeworks. You **do not** need to formally prove the correctness of your constructions unless a question specifically asks to do so.

Total points available: 100

0. Read pages 41 – 63 up to Section 1.3 in the class-book (Sipser, 3rd edition).

1. **(30 points)** Solve problem **1.7** from the class-book (**except for the items (a) and (f)**).

2. **(20 points)** Solve problem **1.14** from the class-book.

3. **(20 points)** Solve problem **1.13** from the class-book. You might find the **Example 1.41** in the class-book helpful.

4. **(10 points)** Construct an NFA that recognizes the language

   $$L = (011 \cup 001 \cup 100)^*.$$

   Note that a string $w = w_1 w_2 \dots w_k \in \{0,1\}^*$ belongs to $(011 \cup 001 \cup 100)^*$ if $w_1 w_2 w_3 \in \{011, 001, 100\}$, $w_4 w_5 w_6 \in \{011, 001, 100\}$ and so on. For example, strings $\epsilon, 011, 100001, 001100011001$ belong to this language. While strings $10, 111, 101, 0110, 010001$ **do not** belong to L.

5. **(20 points)** Formally prove that your solution for the problem 1.6 item (b) from the previous homework is correct. That is, prove that the computation on your automaton for all strings $w \in \{0,1\}^*$ that contain at least 3 '1's ends in an accept state. While computation on all other strings ends in one of the non-accept states.

   Present the proof along with the automaton construction. You can use induction or other proof techniques that you find suitable. Note that we will grade only the proof part, but not the DFA construction.