

Homework 7
Com S 331, Spring 2017

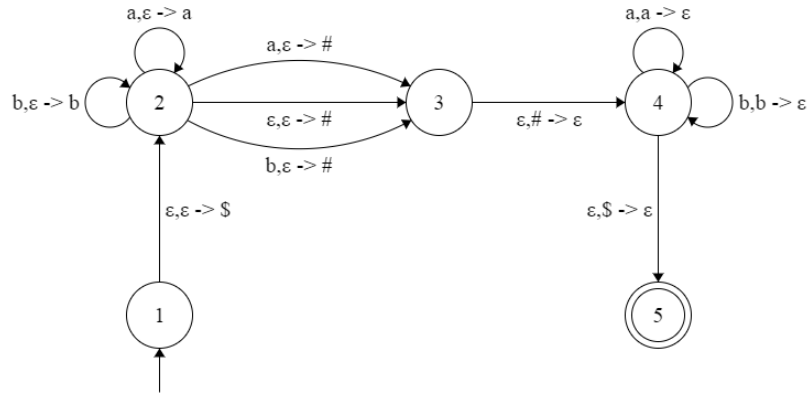
Due date: **Wednesday, March 22, 2017**

Please submit the homework via BlackBoard **before the class that day**.

Note: All submissions should be **typed** and in .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. However, in most cases you need to present a reasonable justification of correctness.

Total points available: 75 (115 with extra credit)

0. Read pages 125–129 up to the end of Section 2.3 in the class-book (Sipser, 3rd edition).
1. **(15 points)** Consider the following PDA, P , that recognizes the context-free language $L = \{w \in \{a, b\}^* \mid w = w^R\}$, i.e., all palindromes over the $\{a, b\}$ alphabet:



Recall the proof of Lemma 2.27 in the class-book (the proof that every PDA recognizes a certain CFL), and note that P is of such form that every transition either pops a symbol from the stack, or pushes a symbol on the stack (but does not do both), as required by the proof. Let G_P be the grammar constructed as suggested by the proof of the Lemma. Provide a step-by-step derivation of a string $baaab$ generated by P_G .

That is, show the steps $A_{1,5} \Rightarrow u_1 \Rightarrow \dots \Rightarrow u_k \Rightarrow baaab$, where $A_{1,5}$ is the start variable in grammar G_P . **Note:** you do not need to write out all the rules in the grammar G_P , but only the ones needed

for the derivation.

2. **(30 points)** Solve Problem **2.31** from the class-book.
3. **(30 points)** Solve Problem **2.32** from the class-book.
4. **(Extra credit: 40 points)** Solve Problem **2.33*** from the class-book.