

**General hint:** If it is very difficult to find a way to make the pumping theorem work for a given language that appears to be non-regular, consider the possibility that the language might actually be regular.

1. 8.8
2. (t-3-6) 8.8 de
3. (t-9) 8.9 This is a difficult problem. Begin thinking about it a few days before it is due.
4. (t-9) 8.10-a I.e., given a DFSM  $M = (K, \Sigma, \delta, s, A)$  such that  $L(M)=L$ , construct a DFSM  $M^*=(K^*, \Sigma, \delta^*, s^*, A^*)$  such that  $L(M^*)=\text{maxstring}(L)$ .
5. (t-6) 8.16a (this one is a little bit "logically tricky")
6. 8.16b
7. 8.21 (I like to put questions like these on exams)
8. (t-12) 8.21n (this is a nontrivial problem)
9. (t-3) 8.21o
10. 9.1 You can assume (and use without giving the details of the algorithms) any algorithms and decision procedures from chapter 9 or previous chapters.
11. (t-6) 9.1b See note below.
12. (t-6) 9.1d
13. (t-6) 9.1g. See note below.
14. (t-6) 9.1i

**9.1g:**

There is a small error in the statement of the problem.  $a^*$  should be  $\{a\}^*$

**9.1b:**

Note that  $|L(M)|$  means "the number of elements in the language accepted by the machine  $M$ ". Note that for some machines  $M$ , the language is countably infinite.

## Previous questions and answers from Piazza:

**General question:** Is every Nonregular language countable in size? **A** Every language is countable (I.e. it is finite or countably infinite, because  $\Sigma$  is finite..

**General question:** Can we assume we know how to check if there are loops in a DFSM as the books assumes? **A** Yes. Unless a problem specifically states otherwise, for decision procedure problems, you may assume anything that is in an result in the book, the homework, or a class example or exercise.

**Question on #8:** I'm stuck on how to prove this one. Any particular rule I should be using,??

**Hint 1:** It's true. All of the credit is for showing that.

**Hint 2:** I am not sure how you could show this except by construction. I.e., describe how, given any non-regular language  $L$ , we can construct an infinite set  $T$  of regular languages, such that the intersection of all of the languages in  $T$  is exactly the set  $L$ .

**Hint 3:** The notion of "complement of a language" can be useful here.