

CS 273: Intro to Theory of Computation, Fall 2007

Quiz 2 (Thursday, October 11th)

NAME:

NETID:

This quiz has 3 pages containing 8 questions. None requires a long answer. Proofs and justifications are only required when the question explicitly asks for them. Please ensure your answers are legible. You have 20 minutes to finish.

1. (1 points) A PDA is basically an NFA with one extra feature. What's the extra feature?
2. (2 points) Is the language $\{a^n b^m \mid n \in \mathbb{N}, m \in \mathbb{N}\}$ regular? Why or why not?
3. (4 points) Give a context-free grammar that generates each of the following subsets of $\{a, b, c\}^*$. Just give the rule(s) for each grammar. Assume that the start symbol is always S and variables are uppercase letters.
 - (a) $\{a^n b^n \mid n \geq 0\}$
 - (b) $c^* \cup b^*$

4. (2 points) What language is generated by the following context-free grammar, with start symbol S ?

$$S \rightarrow AA$$

$$A \rightarrow a \mid b$$

5. (4 points) Give an example of a context-free grammar G which is ambiguous. Explain why it is ambiguous by showing two parse trees yielding the same string.

6. (4 points) Define what it means for a function mapping strings to strings to be a homomorphism.

7. (4 points) We showed in class that the language $B = \{0^n 1^n \mid n \geq 0\}$ is not regular. Let $L = \{2^i 0^n 1^n \mid n \geq 0, i \geq 0\}$. Prove that L is not regular using closure properties and the fact that B isn't regular.

8. (4 points) Finish the following statement of the pumping lemma.

If A is a regular language, then there is a number p such that, if s is any string in A of length at least p , then ...