

CS 334 – Fall 2004: General Review Exercises

1. What is a language?
2. What is a problem?
3. What is an algorithm?
4. Explain the following terms: recursive, recursive enumerable, solvable, unsolvable, decidable, undecidable, computable, uncomputable.
5. What is an abstract model of computation? Give some examples.
6. Draw the Chomsky hierarchy. Give an example of a language that belongs to each part of the hierarchy. Then for each part, give an example of a language that is not in that part. Prove your answers.
7. Discuss determinism and non-determinism for each part of the Chomsky hierarchy.
8. For which abstract models of computation are determinism and non-determinism equivalent?
9. For which models are determinism and non-determinism distinct (with regard to what languages they can recognize).
10. Explain the difference between accepting by empty stack and accepting by final state. Do these two kinds of PDA's accept different classes of languages?
11. Explain how some Turing machines recognize languages and some compute functions. How do these machines differ and how are they similar?
12. What is the difference between a decision problem and an optimization problem?
13. For each level of the Chomsky hierarchy, state and prove 5 properties.
14. What is it necessary to provide in order to define an abstract machine?
15. True or False: Natural Languages can be recognized by TM's. If your answer is True, show how. If your answer is False, explain why not.
16. True or False: Languages that have context free grammars can be recognized by a TM.
17. True or False: Languages that have CF grammars need a TM to recognize them.
18. What is Rice's Theorem? State at least 5 corollaries.
19. Make your own theorem(s) about properties of recursive languages.
20. Prove that there must exist some undecidable problems.