CSE 322
Formal Models in Computer Science
Final exam preparation

Spring 2003
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Remember that the final exam is Monday, June 9 at 8:30-10:20 in our regular classroom.

The final exam will cover the entire course but particularly the following topics. There will be some emphasis on the CFL material.

1. Strings and languages and operations on them.
2. Regular expressions and regular languages.
3. Deterministic finite automata: Formal definition as well as state diagrams.
4. Nondeterministic finite automata: Formal definition as well as state diagrams.
5. Converting NFA's to DFA's: The Subset construction
6. Every regular language is accepted by some finite automaton.
7. Kleene's Theorem: Every language accepted by a finite automaton is regular.
8. Closure of regular languages under intersection and complement, as well as union, concatenation and Kleene star.
9. The Pumping Lemma for Regular Languages; Using it to prove languages non-regular
10. Myhill-Nerode theorem and its implications: Using it to prove that languages are not regular and to prove bounds on minimum number of states needed by a DFA for regular languages. The fact that there is a unique minimal DFA for any regular language.
11. Context-free grammars and languages: Formal definitions, derivations and parse trees, ambiguity.
12. Pushdown Automata: Formal definitions and acceptance
13. Every CFL is accepted by some PDA: Construction of PDA from CFG, both top-down and bottom-up constructions.
14. Everything accepted by a PDA is a CFL; Converting a PDA into a grammar.
15. Closure properties of CFL's: Union, concatenation, Kleene star, intersection with regular sets.
16. Pumping Lemma for CFL's: Proofs that languages are not CFL's, CFL's not closed under intersection or complement.
17. Ability to tell whether languages are regular, context-free or neither.
18. Tha fact that membership in any CFL can be recognized in $O(n^3)$ time (by the Cocke-Kasami-Younger algorithm).
19. Informal understanding of definition and operation of Turing machines
20. Turing-recognizable and Decidable languages
21. Church-Turing thesis.
22. Informal understanding of Universal Turing Machines.
23. Diagonalization, countability, and undecidability.
24. Undecidability of certain natural properties of programs, such as the halting problem.