

Review Sheet for the Final Exam

Regular Languages: Deterministic and non-deterministic finite automata, configurations, regular languages, regular expressions, closure properties of regular languages, decision algorithms for problems about regular languages, the pumping lemma for regular languages.

Context-Free Languages: Context-free grammars, configurations, context-free languages, derivations and parse trees, Chomsky Normal Form, ambiguity, pushdown automata, the pumping lemma for CFLs, closure properties of the class of CFLs, decision algorithms for problems about CFLs.

Computability: Turing machines of different types, configurations, recursive and recursively enumerable languages, Church's thesis, undecidability, halting problem, countable vs. uncountable sets, diagonalization, mapping reducibility and its properties, Rice's theorem.

Logic: Formulas, satisfiability, Conjunctive Normal Form (CNF), formulas in 2CNF, formulas in 3CNF.

Complexity theory: Time and space complexity, simulations between machine models, deterministic time and space, non-deterministic time and space, Savitch's theorem, complexity classes such as TIME(.), NTIME(.), SPACE(.), NSPACE(.), P, NP, coNP, PSPACE, NPSPACE, and EXP, relations among and closure properties of these classes, the two definitions of the class NP (based on polynomial-time non-deterministic TM and based on polynomial-time verifier).

NP-Completeness: Definition of NP-Completeness, Cook-Levin's theorem, polynomial-time reducibility and its properties, particular problems such as CLIQUE, HAMPATH, SAT, 3SAT, IS, VC, TSP, etc.