

Paper - IV: Automata Theory

CS 204T

Unit - I

Fundamentals alphabets, strings, languages, problems, graphs, trees, Finite State Systems, definitions, Finite Automaton model, acceptance of strings, and languages, Deterministic finite automaton and Nondeterministic finite automaton, transition diagrams, transition tables, proliferation trees and language recognizers, equivalence of DFA's and NFA's.

Finite Automata with moves, significance, acceptance of languages, -closure, Equivalence of NFA's with and without - moves, Minimization of finite automata, Two-way finite automata, Finite Automata with output- Moore and Melay machines.

Unit - II

Regular Languages: regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, conversion of finite automata to regular expressions. Pumping lemma of regular sets and its applications, closure properties of regular sets.

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and finite automata, inter conversion, Context free grammar, derivation trees, sentential forms, right most and leftmost derivation of strings, ambiguity.

Unit - III

Context Free Grammars: Simplification of Context Free Grammars, Chomsky normal form, Greiback normal form, Pumping lemma for context free languages and its applications, closure of properties of CFL (proofs omitted).

Push Down Automata: PDA definition, model, acceptance of CFL, acceptance by final state and acceptance by empty state and its equivalence. Equivalence of PDA's and CFL's, inter-conversion. (Proofs not required).

Unit - IV

Membership Algorithm (CYK Algorithm) for Context Free Grammars.

Turing Machine: TM definition, model, design of TM, computable functions, unrestricted grammars, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs omitted). Linear bounded automata and Context sensitive language.

Computability Theory: Chomsky hierarchy of languages, Introduction to DCFL, DPDA, LR(0) grammar, decidability and undecidable problems. Definitions of P and NP problems, NP complete and NP hard problems.

Text Book: J. E. Hopcroft, J. D. Ullman, *Introduction to Automata Theory, Languages, and Computation (3rd edition)*

References

1. Mishra, Chandrashekar, *Theory of Computer Science*
2. ZviKohav, Niraj K Jha, *Switching and Finite Automata Theory*
3. Perter Linz, *An Introduction to Formal Languages and Automata*
4. John C. Martin, *Introduction to Languages and the Theory of Computation*