List of topics – Computing

I. Finite Automata

1. Deterministic and non-deterministic
2. Regular languages
3. Kleen Algebra
4. Pumping lemma
5. Myhill-Nerode theorem

II. Stack automatons and Context-free Languages

1. Normal forms
2. Pumping Lemma
3. Cocke-Kasami-Younger Algorithm
4. Chomsky-Scutzenberger Theorem
5. Parikh's Theorem

III. Turing Machines and effective computability

1. Basic Turing machines model
2. Computable languages and functions
3. Techniques for building Turing machines
4. Turing Machine changes
5. Church Hypothesis
6. Turing machine enumeration
7. Restricted Turing machines but equivalent to the basic model

IV. Recursive functions theory

1. Primitive recursive functions
2. M-recursive functions
3. computational models equivalence and Church thesis

IV. Undecidability

1. Problems
2. Properties of recursive and recursively enumerable language
3. Universal Turing machine and undecidable problems
4. Rice theorem
5. Undecidability of Post correspondence problem
6. Valid and invalid computations on Turing machine
7. Undecidable problemson contrext-free grammar
8. Greibach Theorem, Oracle computation

VI. Complexity Classes in time and space

1. Canonical classes
2. Completion
3. Hierarchy and diagonalization theorems, alternating complexity classes

VII. Reducibility and Completeness

1. Reductible relations
2. Complete languages and Cook theorem
3. NP-Complete problems and completeness problems
4. NP-hard problems
5. P=NP Problems
6. Complete problems for NL
7. P and PSPACE

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