

CPSC 326 Final Review

1 Topics

Topics, which may appear in our final. Make sure you know this material.

- Foundations.
- Languages.
- Finite Automata.
- Turing Machines.
- Computability.

If you have trouble with any of these topics come see me during office hours so we can review them together.

2 Sample Questions

2.1 Languages

1. Give the definition of *canonical order* over Σ^* .
2. What is the definition of a word over Σ ?
3. What is the definition of a Language over Σ ?
4. Let $w = ab$ for $\Sigma = \{a, b\}$. What are the following string:
 - (a) w^0 ?
 - (b) w^3 ?
 - (c) w^1 ?
 - (d) w^2w ?
 - (e) $w^0w^0w^2w^0$?

2.2 FA

1. Let the language accepted by a finite automaton M_2 be the following

$$L(M_2) = \{w \in \{0,1\}^* \mid w \text{ ends in a } 1\}$$

- (a) Give the formal description of M_2 by describing each of its components in
 $M_2 = (Q, \Sigma, \delta, q_0, F)$.
 - (b) Give the state diagram of M_2 .
2. Let $L = \{w \in \{a,b\}^* \mid w \text{ has even length and contains the substring } ab\}$. Define a *NFA*, M , such that $L(M) = L$. You need only give the diagram.
 3. Let $\Sigma = \{0,1\}$. Let $L = \{0^i 0^j \mid i > j\}$. Use the pumping lemma to prove that L is not regular.

2.3 TMs

1. Let $L = \{w \in \Sigma_{bool}^* \mid w = 0^n 1^n, n > 0\}$. Is L a regular language? Design a TM to recognize L . You need only give the state diagram.

2.4 Computability

1. Prove that \mathbb{Q} (the set of rational numbers) is countable or uncountable.
2. Let $L_{DFA} = \{\langle Kod(M), w \rangle \mid M \text{ is a DFA, } w \in \Sigma_{bool}^*, \text{ and } M \text{ accepts } w\}$. Is L_{DFA} decidable? Prove your answer.