

CSE422 Theory of Computation

HOMEWORK I

Due April 19, 2023 23:59

1. Prove that the class of regular languages is closed under intersection.
2. Let M be a nondeterministic finite automaton for the set of all binary strings that have either the number of 0's odd, or the number of 1's not a multiple of 3, or both.
 - (a) Define M formally with a clear definitions of the 5-tuple. And define the language $A = L(M)$ as described above.
 - (b) Draw the state diagram of M .
 - (c) Is A the only language M recognise?
 - (d) Give an example string from A and show M accepts that string.
 - (e) Is that possible to describe this language in terms of regular expressions? If so, give the expression. If not, prove.
3. Given
$$S \rightarrow aSb|Ab$$
$$A \rightarrow aA|\epsilon$$
and
$$S \rightarrow aSb|T$$
$$T \rightarrow aTb|\epsilon$$
 - (a) Are they define proper context free grammars?
 - (b) Are they ambiguous?
 - (c) Is that possible to find a push down automaton that is equivalent to the given grammars? If so, define that.
4. Consider a nondeterministic pushdown automaton that has a single stack and that can move its input head in both directions on the input tape. In addition we assume that this PDA is capable of detecting when its input head is at either end of its input tape. This PDA accepts its input by entering an accept state.
Show that this PDA can recognise the language $\{a^i b^i c^i | i \geq 0\}$

5. Questions to answer from the text book: Intro to the theory of computation by M. Sipser (2nd edition)

- (a) 1.4 part f.
- (b) 1.21 parts a and b.
- (c) 1.46 part d
- (d) 1.54
- (e) 1.55 parts c,h,j.
- (f) 2.4 part e.

NOTE: Upload your HANDWRITTEN answers to the Teams course page.