

Assignment 7
CSCE 4323: Formal Languages and Computability
Fall 2018

Solutions to the remaining problems should be typed and contained in a PDF, but may include figures neatly drawn by hand and included in the PDF. Proper notation and terminology must be used.

1. Let $ALL_{DFA} = \{\langle A \rangle \mid A \text{ is a DFA and } L(A) = \Sigma^*\}$. Show that ALL_{DFA} is decidable.
2. Let \mathcal{B} be the set of all infinite sequences over $\{0, 1\}$. Show that \mathcal{B} is uncountable, using a proof by diagonalization.
3. Let $T = \{(i, j, k) \mid i, j, k \in \mathbb{N}\}$. Show that T is countable.
4. Let $S = \{\langle M \rangle \mid M \text{ is a DFA that accepts } w^R \text{ whenever it accepts } w\}$. Show that S is decidable.
5. Let $T = \{\langle M \rangle \mid M \text{ is a TM that accepts } w^R \text{ whenever it accepts } w\}$. Show that T is undecidable.
6. Consider the problem of determining whether a Turing machine M on an input w ever attempts to move its head left at any point during its computation on w . Formulate this problem as a language and show that it is decidable.
7. Consider the problem of determining whether a Turing machine M on an input w ever attempts to move its head left when its head is on the left-most tape cell. Formulate this problem as a language and show that it is undecidable.