Assignment 7

Computer Science 235

Reading. Sections 4.1 and 4.2

1) Consider the problem of determining whether a DFA and a regular expression are equivalent. Express this problem as a language and show that it is decidable.

2) Let $A\varepsilon_{CFG} = \{\langle G \rangle \mid G \text{ is a CFG that generates } \varepsilon\}$. Show that $A\varepsilon_{CFG}$ is decidable.

3) Let Ψ be the set of all infinite sequences over $\{0, 1\}$. Show that Ψ is uncountable using a proof by diagonalization.

4) A ***useless state*** in a pushdown automaton is never entered on any input string. Consider the problem of determining whether a pushdown automaton has any useless states. Formulate this problem as a language and show that it is decidable.

5) Let $A = \{\langle R, S \rangle \mid R \text{ and } S \text{ are regular expressions and } L(R) \subseteq L(S)\}$. Show that A is decidable.

6) Let R be a regular expression and let G be a CFG. Show that the problem of determining whether there exists a string that is generated by both R and G is decidable (note, we are not checking if a specific string w is generated by both R and G but rather if there exists any string that is generated by both R and G).