Foundations of Computing Science (CS60005)

TUTORIAL 5

- $A_{DFA} = \{\langle B, w\rangle | B$ is a DFA that accepts input string w $\}$
- $A_{NFA} = \{\langle B, w\rangle | B$ is a NFA that accepts input string w $\}$
- $A_{REX} = \{\langle R, w\rangle | R$ is a regular expression that generates string w $\}$
- $E_{DFA} = \{\langle A\rangle | A$ is a DFA and $L(A) = \phi$ $\}$
- $EQ_{DFA} = \{\langle A, B\rangle$ | A and B are DFAs and $L(A) = L(B)$ $\}$
- $A_{CFG} = \{\langle G, w\rangle | G$ is a CFG that generates string w $\}$
- $E_{CFG} = \{\langle G\rangle | G$ is a CFG and $L(G) = \phi$ $\}$

1. Let $ALL_{DFA} = \{\langle A\rangle | A$ is a DFA and $L(A) = \Sigma^*\}$. Show that ALL_{DFA} is decidable.
2. Let $A = \{\langle R, S\rangle | R, S$ are regular expressions and $L(R) \subseteq L(S)\}$. Show that A is decidable.
3. Let $S = \{\langle M\rangle | M$ is a DFA that accepts w^R whenever it accepts $w\}$. Show that S is decidable.
4. Let $A = \{\langle M\rangle | M$ is a DFA which doesn't accept any string containing an odd number of 0's $\}$. Show that A is decidable.
5. Show that the problem of testing whether a CFG generates some strings in $1^\star$ is decidable.
6. Given the language $E = \{\#x_1\#x_2\#......\#x_l$ | each $x_i \in \{0,1\}^\star$ and $x_i \neq x_j$ for each $i \neq j$ $\}$. Write a decider for this lan.