Foundations of Computing Science (CS60005)

TUTORIAL 6

- $A_{DFA} = \{\langle B, w\rangle | B$ 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 A and B be two disjoint languages. Say that language C separates A and B if $A \subset C$ and $b \subset \overline{C}$. Show that any two disjoint co-Turing-recognizable languages are separable by some decidable language.
2. Let PAL_{DFA}= $\{\langle M\rangle | M$ is a DFA that accepts some palindrome$\}$. Show that PAL_{DFA} is decidable.
3. Show that EQ_{CFG} is undecidable.
4. Let $T = \{\ \langle M\rangle | M$ is a TM that accepts w^R whenever it accepts $w\}$. Show that T is undecidable.
5. Show that A is Turing-recognizable iff $A \leq_m A_{TM}$.