Tutorail-7

Q1. Let ALLDFA ={ <A>I A is a DFA and L(A) = ∑\*} . Show that ALLDFA is decidable.

Q2. Let AECFG = {<G> I G is a CFG that generates €}. Show that AECFG is decidable.

Q3. Let B be the set of all infinite sequences over {0,1}. Show that B is uncountable,

using a proof by diagonalization.

Q4. Let T = { (i, j, k) | }. Show that T is countable.

Q6. Let INFINITEDFA ={<A>|A is a DFA and L(A) is an infinite language}. Show that INFINITEDFA is decidable.

Q7. Let INFINITEPDA = { <M> I M is a PDA and L(M) is an infinite language}. Show that INFINITEPDA is decidable.

Q8. Let A = {<M>| M is a DFA which doesn't accept any string containing an odd number of 1s}. Show that A is decidable.

Q9. Let A = {<R, S>| R and S are regular expressions and L(R) L(S)}. Show that A is decidable.

Q10. Let Z = {0,1}. Show that the problem of determining whether a CFG generates some string in 1\* is decidable.

Q11. Show that the problem of determining whether a CFG generates all strings in 1\* is decidable.

Q12. Let A = {<R>I R is a regular expression describing a language containing at least

one string w that has 111 as a substring (i.e., w = x111y for some x and y)}. Show

that A is decidable.

Q13. Prove that EQDFAL is decidable by testing the two DFAs on all strings up to a certain size (called limit DFA).

Q14. Let C be a language. Prove that C is Turing-recognizable iff a decidable language

D exists such that C ={ x | y (<x,y> D)}.

Q15. Let S = {<M> I M is a DFA that accepts wR whenever it accepts w}. Show that S

is decidable.

Q16. A language is prefix-free if no member is a proper prefix of another member. Let PREFIX-FREEREX = {R | R is a regular expression where L(R) is prefix-free}. Show that PREFIX-FREEREX is decidable.

Q17. Say that an NFA is ambiguous if it accepts some string along two different computation branches. Let AMBIGNFA = {<N> I N is an ambiguous NFA}. Show that AMBIGNFA is decidable.

Q18. 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.

Q19. Repeat Q18 the same for DFA.

Q20. Repeat Q18 the same for NFA.

Q21. Let BALDFA = {<M>I M is a DFA that accepts some string containing an equal number of 0s and 1s. Show that BALDFA is decidable.

Q22. Let BALNDFA = {<M>I M is a DFA that accepts some string containing an non-equal number of 0s and 1s. is that BALNDFA is decidable. Comment on closure of TMs on implementation.

Q23. Let PALDFA = {<M>I M is a DFA that accepts some palindrome}. Show that PALDFA is decidable.

Q24. Let E = {<M> I M is a DFA that accepts some string with more Is than 0s}. Show that E is decidable.

Q25. Let C = { <G, x>) | G is a CFG that generates some string w, where x is a substring of w }. Show that C is decidable.