

Week 11 Tutorial Session

(1) Show that the following languages are decidable.

(a) $L_1 = \{\langle R \rangle \mid R \text{ generates at least one string } w \text{ that has } 111 \text{ as a substring}\}$
Here R is a regular expression over alphabet $\{0, 1\}$.

(b) $E_{\text{CFG}} = \{\langle G \rangle \mid \text{Context-free grammar } G \text{ generates no strings } (L(G) = \emptyset)\}$

(2) For each of these languages, say whether it is decidable. Justify your answer.

(a) $L_1 = \{\langle M, w, t \rangle \mid \text{Turing machine } M \text{ accepts } w \text{ within } t \text{ transitions}\}$

(b) $L_2 = \{\langle M \rangle \mid \text{Turing machine } M \text{ recognizes strings of odd length}\}$

Recall that a Turing machine M recognizes a language L if M accepts all strings in L and nothing else.