

582206 Models of Computation (Autumn 2009)

Exercise 10 (24–27 November)

1. Give a context-free grammar for the language $\{ a^i b^j c^k \mid i = 2j \text{ or } j = 2k \}$. Transform your grammar into an equivalent push-down automaton using the method given in the textbook.
2. Show that if A is context-free and B is regular, then $A \cap B$ is context-free.
Hint: similar construction as in the proof of Theorem 1.25, pp. 45–47.
3. Let the language C over the alphabet $\{ a, b, c \}$ consist of all strings with an equal number of a , b and c characters. Show that C is not context-free.
Hint: Use the previous result. Write $A = C \cap R$, where C is regular and A is a language that is known not to be context-free.
4. [Sipser Problem 2.31] Let D be the language of all palindromes over $\{ 0, 1 \}$ containing an equal number of 0s and 1s. Show that D is not context-free.