CSA 2201
Formal Languages and Compilers

Assignment 1

This assignment is worth 20% of the final mark of the Formal Languages and Automata course. The documentation explaining your results are to be handed to the departmental secretary by Tuesday 10th November 2009. Assignments handed in late will be marked down by 4 marks (out of 20) per day. No assignments will be accepted after Monday 16th November 2009.

The Department of Computer Science takes a very serious view on plagiarism. Refer to the departmental website on plagiarism for more details:

http://www.cs.um.edu.mt/resources/plagiarism/

You are to solve all of the following problems.

Questions 1,3 and 4 carry 6 marks. Question 2 carries 2 marks.

1. Consider the grammar

   \[ G_1 = \langle \{a\}, \{A\}, A, \{A \rightarrow aA, A \rightarrow a\} \rangle. \]

   Prove that \( L(G_1) = \{a^n \mid n \geq 1\} \).

2. Consider the grammar

   \[ G_2 = \langle \{a\}, \{A\}, A, \{A \rightarrow aA, A \rightarrow \epsilon\} \rangle. \]

   Prove that \( L(G_2) \neq L(G_1) \).

3. Consider the grammar

   \[ G_3 = \langle \{a, b\}, \{A, B\}, A, \{A \rightarrow Aa, A \rightarrow B, B \rightarrow a\} \rangle. \]

   Prove that \( L(G_3) = L(G_1) \).

4. Consider the grammar

   \[ G_4 = \langle \{a\}, \{A, B, C\}, A, \{A \rightarrow aB, B \rightarrow aB, B \rightarrow \epsilon, C \rightarrow a\} \rangle. \]

   Prove that \( L(G_4) = L(G_1) \).