Laurea Magistrale in INFORMATICA
Principi di Linguaggi di Programmazione
Compiler Techniques

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Regular Exam V - July 18th 2014
(Available Time: 2 hours. Mandatory: In each exercise, get at least, one half of the assigned points)

Exercise 1 (pts 10). Let $L = \{a^m b^n b^m c^n \mid n,m \geq 0\}$.
    a) Prove that L is not a regular language;
    b) Write a linear, context-free grammar for L;
    c) Prove that the given grammar is linear.

Exercise 2 (pts 10). Let G be the grammar below:
    S::= a S a | b A a | b c
    A::= b A | a
(a) Show its Coll(1);
(b) Looking at the collection, answer:
    [1] is G an LR(1) grammar?
    [2] is G a LALR(1) grammar?
    [3] is G a SLR(1) grammar.
(c) Show the best linear parsing table and its use during the analysis of "abbaa".

Exercise 3 (pts 10). Extend the language "Semplice" with the non-determined iterator loop having the following syntax:
    Cmd ::= **loop** Exp **in** List **pool**
    List ::= Pair List
    Pair ::= **default :** Cmd | Exp **:** Cmd | **:** Cmd

The expression following the tag **loop** is the *loop-expression*, while the expressions, if any, on the left hand of each pair are *label-expressions*. The command which is paired with the tag **default** is the *default-command*, the other commands are called *labelled-* and *unlabelled-* according to the form of the pair.

Loop has the following behaviour: At each iteration, the *loop-expression* is evaluated. Let v_i be its value at the *i-th* iteration. Then, the pairs are considered from left to right, and the *label-expressions*, if any, are evaluated in that order, looking for the first pair whose *label-expression* has value v_i. Once the pair is found, its command and all the *labelled-* and *unlabelled-* commands, in the pairs that follow, are executed and then, a new iteration is started. If such a pair is not found, then the *default-command* is executed and the execution of loop ends.

Choose to answer to (a) or (b). Extend the the translation scheme of Semplice
    (a) with attributes:
        1. to check that only one default-command is included in a command loop,
        2. to check whether the list contains one loop command as labelled-command
        3. to compute the number of labelled- and that of unlabelled commands, resp.
    (b) to produce, by side-effects, the 3AC of loop.