

Compiler Construction 2018/19

— Exercise Sheet 9 —

Hand in until December 17th before the exercise class.

Exercise 1

(7 Points)

Consider the following grammar $G = (N, \Sigma, P, S')$, $N = \{S', S, A\}$, $\Sigma = \{a, b\}$ with inherited attributes $i1, i2$ and synthesised attributes $s1, s2$.

$$\begin{array}{ll}
 S' \rightarrow S & \begin{array}{l} i1.1 = s1.1 \\ i2.1 = i1.0 \\ s1.0 = 1 \\ s2.0 = s2.1 \end{array} \\
 S \rightarrow AA & \begin{array}{l} i1.1 = s1.1 \\ i2.1 = s2.1 \\ i1.2 = 0 \\ i2.2 = i2.0 \\ s1.0 = s2.1 \\ s2.0 = s2.2 \end{array} \\
 S \rightarrow A & \begin{array}{l} i1.1 = 0 \\ i2.1 = i2.0 \\ s1.0 = 0 \\ s2.0 = s2.1 \end{array} \\
 A \rightarrow a & \begin{array}{l} s1.0 = 0 \\ s2.0 = i1.0 \end{array} \\
 A \rightarrow b & \begin{array}{l} s2.0 = 0 \\ s1.0 = i2.0 \end{array}
 \end{array}$$

- (a) Provide the dependency graph for each production in G .
- (b) Apply the circularity test from the lecture to G .
 1. Calculate the set $IS(A)$ for all $A \in N$.
 2. Is G circular? Justify your answer.
- (c) We consider strong noncircularity of G .
 1. Calculate the set $IS'(A)$ for all $A \in N$.
 2. Is G strongly noncircular? Justify your answer.

Exercise 2

(3 Points)

Which of the following procedure stacks could result from the execution of an EPL-programm? Justify your answer.

- (a) $p_1 = 4 : 3 : 10 : 0 : 7 : 2 : 5 : 4 : 3 : 8 : -1 : 0 : 0 : 0 : 5$
- (b) $p_2 = 6 : 5 : 4 : 3 : 6 : 6 : 5 : 4 : 4 : 2 : 0 : 0 : 0 : 0 : 0$
- (c) $p_3 = 9 : 3 : 3 : 1 : 5 : 4 : -3 : -2 : -4 : 4 : 3 : 2 : 1 : 0 : 0 : 0 : 0 : 0$
- (d) $p_4 = 9 : 8 : 10 : 5 : -2 : 9 : 7 : 14 : 8 : 5 : 4 : 2 : 2 : 5 : 3 : 3 : 2 : 1 : 0 : 0 : 0$
- (e) $p_5 = 7 : 3 : 84 : -2 : 3 : 2 : 10 : 5 : 4 : 3 : 1 : 0 : 0 : 0 : 1 : 0 : 0 : 0$
- (f) $p_6 = 9 : 3 : 10 : 84 : 5 : 4 : 0 : 0 : 0 : 3 : 2 : 42 : 0 : 0 : 0$