

Compiler Construction 2017

— Exercise Sheet 8 —

Hand in until July 25th before the exercise class.

Exercise 1

(2 Points)

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

- (a) $p_1 = 13 : 3 : 9 : 1 : 4 : 3 : 2 : 2 : 4 : 5 : 5 : 15 : 1 : 3 : 2 : 12 : 0 : 0 : 0$
- (b) $p_2 = 3 : 2 : 22 : 5 : 4 : 12 : 7 : 5 : 4 : 0 : 17 : 3$
- (c) $p_3 = 4 : 3 : 7 : 1 : 4 : 3 : 2 : 1 : 0 : 0 : 0 : 0 : 0$
- (d) $p_4 = 8 : 3 : 4 : 1 : 4 : 3 : 4 : 3 : 0 : 0 : 0 : 0 : 0$

Exercise 2

(2 Points)

Consider the following intermediate code:

```

        ⋮
6:  LIT(4);
7:  LOAD(1, 2);    (dif, off)
8:  ADD;
9:  RET;
10: LOAD(2, 2);    (dif, off)
        ⋮
25: CALL(7, 1, 2); (ca, dif, loc)
26: CALL(38, 1, 3); (ca, dif, loc)
27: ADD;
    
```

Give the next four states of the abstract machine starting in:

$$(ca, d, p) := (7, -3 : 4, 9 : 4 : 26 : 3 : 7 : 4 : 3 : 36 : 5 : 10 : 4 : 40 : 1 : 2 : 5 : 4 : \dots)$$

Recall that the procedure stack has the form:



and the *base*-function is defined as:

$$\begin{aligned}
 base(p, 0) &:= 1 \\
 base(p, dif + 1) &:= base(p, dif) + p.base(p, dif)
 \end{aligned}$$

Exercise 3

(2 Points)

In addition to **while**-loops we want to have **for**-loops with implicit declaration of the counter variable in our example programming language:

for (var *X* := *A* ; *B* ; *C*₁) *C*₂

- (a) Extend the translation function ct accordingly. You may assume that the variable X is already declared, i.e., it is $update(var\ X, st, l)$ with st the symbol table and l the current level.
- (b) Generate intermediate code for

```
for (var x := 0; x < 10; x := x + 1) P()
```

without parameters for the CALL instruction generated for P().