

Abstract Machines

Summer Semester 2004

4. Homework

Deadline: 26 May 2004 12:00

Exercise 1:

4 Points

Consider the function definition

```
fn x,y,z => let x = 1;
             a = 3;
             b = 4
             in (a+(b+(x+(y+z))))
```

Determine the address environment ρ that will be used to generate code for the sum $(a + (b + (x + (y + z))))$. Determine the absolute addresses of a, b, x, y, z when code for $(a + (b + (x + (y + z))))$ is generated with initial stack distance $kp = 5$.

Exercise 2:

6 Points

Generate code for the following expressions:

a) `fn x,y,z => x z (y z)`

with address environment $\rho = \emptyset$ and initial stack distance $kp = 0$.

b) `fn x => if x=1 then 1 else x*fac(x-1)`

with address environment $\rho = \{fac \mapsto (L, 1)\}$ and initial stack distance $kp = 0$.

Exercise 3:

10 Points

Consider the following Call-By-Value generated code for a PuF expression.

```
alloc 1          mkbasic          pushloc 4
pushloc 0        pushloc 5        pushglob 0
mkvec 1          pushglob 0       apply
mkfunval _0     apply            _7:jump _6
jump _1         _4:jump _3        _5:pushloc 0
_0:targ 2       _2:pushloc 0      _6:
pushloc 0       getbasic         _3:return 2
getbasic       pushloc 2        _1:rewrite 1
pushloc 2      getbasic         mark _8
getbasic      le               loadc 6
gr            jumpz _5         mkbasic
jumpz _2      mark _7         loadc 4
mark _4       pushloc 4       mkbasic
pushloc 3     getbasic        pushloc 5
getbasic     pushloc 4       apply
pushloc 5    getbasic        _8:slide 1
getbasic     sub             halt
sub          mkbasic
```

- a) Determine the stack distance kp for every program point (initially $kp = 0$).
- b) What does this program compute ?