

2007 Paper 13 Question 7

Concepts in Programming Languages

- (a) Give an overview of the LISP abstract machine (or execution model) and comment on its merits and drawbacks from the viewpoints of programming, compilation, execution, etc. [5 marks]
- (b) Define the following parameter-passing mechanisms: pass-by-value, pass-by-reference, pass-by-value/result, and pass-by-name. Briefly comment on their merits and drawbacks. [5 marks]
- (c) What is *aliasing* in the context of programming languages? Explain the contexts in which it arises and provide examples of the phenomenon. [5 marks]
- (d) Consider the Simula declarations

```
CLASS A; A CLASS B;
```

which have the effect of producing the subtype relation $B <: A$, and

```
REF(A) a; REF(B) b;
```

Recall that Simula uses the semantically incorrect principle that

```
if B <: A then REF(B) <: REF(A)
```

and consider now the following Simula code

```
PROCEDURE ASSIGNa( REF(A) x )  
  BEGIN x :- a END ;  
  
ASSIGNa(b);
```

Does it statically type check? If so, will it cause a run-time type error?

Justify your answers. [5 marks]