

2007 Paper 5 Question 6

Compiler Construction

- (a) Describe how a stack is used to implement procedures and functions. [6 marks]
- (b) Suppose a language allows the creation of pointers. How does this complicate the use of stacks as described in part (a)? [2 marks]
- (c) How does the Java language deal with the problem described in part (b)? [2 marks]
- (d) Consider the following ML-like program containing the function `g` that returns a function as a result.

```
let a = 17 in
let g b = (let h c = a + b + c in h) in
let f1 = g 21 in
let f2 = g 33 in
let v = f1(3) + f2(57) in
...
...
```

Explain carefully how such a program can be compiled. In particular, pay special attention to how the code for the body of the function `h` can access the values of `a`, `b`, and `c`. [10 marks]