

COMPUTER SCIENCE TRIPOS Part IB – 2013 – Paper 3

6 Concepts in Programming Languages (MPF)

(a) Give one difference and one similarity between the programming languages:

(i) Algol and Pascal [2 marks]

(ii) SIMULA and Smalltalk [2 marks]

(b) Define the parameter-passing mechanisms: by value, by reference, by value/result, and by name. [4 marks]

(c) What is the type of the expression

$$\text{fn } f \Rightarrow \text{fn } g \Rightarrow \text{fn } x \Rightarrow f(g(f x))$$

given by the SML interpreter? Explain how this is inferred. [6 marks]

(d) Give an example in the SML Modules language of a signature with an opaque type specification together with a structure that matches it. Explain your answer. [4 marks]

(e) List two language innovations of the programming language Scala. Justify your answer. [2 marks]