

2010 Paper 3 Question 4

Compiler Construction

- (a) How is inheritance of class variables typically implemented by a compiler for an object-oriented language in which each class has exactly one parent? [3 marks]
- (b) When supporting multiple inheritance, what extra run-time complexity arises when casting or coercing an object handle up or down and why is this avoided using the Java concept of an interface? [3 marks]
- (c) When supporting multiple inheritance, what identifier clash problem can arise and what are the possible solutions? [4 marks]
- (d) Explain, using an example, the potential for an erroneous downcast in an object-oriented language such as Java, C++ or C#. [4 marks]
- (e) Sketch assembly-level code that
- (i) detects an erroneous downcast;
 - (ii) finds an exception handler for it; and
 - (iii) correctly jumps to the handler.

Assume that the handler is already registered with the run-time system and that there are no arguments to the exception. Use any well-known implementation techniques, such as keeping an object's identity in its virtual method table and stacking exception handlers on an extra run-time stack.

[6 marks]