

# Comparative Programming Languages

## UCT CSC304 – Final Exam – November 2003

Question 1 is compulsory. Then answer either question 2 OR 3.

### Question 1 – General Concepts [15]

1.1. “HTML is a programming language”. State whether or not you agree, and provide a suitable reason. [2]

1.2. C++ is not an orthogonal language. Discuss one feature, or lack of a feature, to justify this statement. [2]

1.3. Draw the stack of activation records corresponding to the following ALGOL-like program when it is at “breakpointX”. [5] (Assume static chains and include all parameters).

```
program main ()
  subprogram funca ()
  {
    funcb ();
  }
  subprogram funcb ()
  {
    subprogram funcc ( int x )
    {
      x = x + 1;
    }
    funcc (6);
    // breakpointX
  }
  funca ();
}
```

1.4. What is the value of the variable “c” after execution of the code below if the parameter is a) pass-by-value b) pass-by-value-result c) pass-by-reference? [6]

```
c = 12;
subprogram xyz ( integer a )
{
  a = a + c;
  c = c + a;
}
xyz (c);
```

### Question 2 – Subprograms and Scope [10]

2.1. How do subprogram side-effects affect the maintainability of programs in a language? [2]

2.2. In a statically-scoped language, why are dynamic links still required in activation records? [2]

2.3.1. If an ALGOL-like language did not allow re-entrant subprograms (e.g., by recursion), are static links still required in stack-based activation records? Give a brief reason for your answer. [1]

2.3.2. Are dynamic links still required? Give a brief reason for your answer. [1]

2.4. Both templates and object-oriented polymorphism are mechanisms that support generic subprograms. Discuss one advantage and one disadvantage of the template approach, when compared to the object-oriented polymorphism approach. [4]

### **Question 3 – Higher-level Languages [10]**

3.1. Perl adopts the “kitchen sink” approach to languages by incorporating multiple redundant features from different paradigms. Explain how this affects readability and writability of programs in Perl. [4]

3.2. Perl programs cannot be fully compiled (like C++). Explain why. [2]

3.3. In Borland Delphi, an image component can display a preview of its contents before the program has been compiled. What features of the programming language and design environment enable this functionality? [4]