OHJ-2050 Principles of Programming Languages

Examination 21.5.2008

No written material, calculators, computers, mobile phones, or other devices allowed.

1. For each of the following paradigms, briefly state its defining characteristics and give typical examples of the paradigm.

   (a) Imperative

   (b) Object-oriented

   (c) Functional

   (d) Logic

   [8]

2. Scalar variables can be classified according to their lifetime as either (i) static, (ii) stack-dynamic, (iii) explicit heap dynamic, or (iv) implicit heap dynamic.

   (a) Briefly explain each of these four classes and give examples where necessary. [4]

   (b) Arrays are classified in a different way. Explain the different storage classes for arrays. [4]

3. Briefly explain each of the following parameter passing methods and, for each method M, write down the three numbers that the Pascal program on the right outputs if parameters x and y are passed as M.

   (a) pass-by-value

   (b) pass-by-reference

   (c) pass-by-value-result

   (d) pass-by-name

```
program p;
var
  k: integer;
  a: array [1..2] of integer;

procedure q(x, y: integer);
begin
  x := x - 1; y := 2 * k
end;

begin
  for k := 1 to 2 do a[k] := k;
  k := 2;
  q(k, a[k]);
  write(k, a[1], a[2])
end.
```

   [4]

4. (a) Explain what is meant by the "software crisis" that started in the 1960's. How does encapsulation address this? [2]

   (b) What are the advantages of objects compared to modules? [2]

   (c) Give an example of a language that contains (i) neither modules nor objects, (ii) modules but not objects, (iii) objects but not modules, (iv) both modules and objects. [2]

5. (a) Give two advantages of incorporating exception handling as a native feature of a programming language. [2]

   (b) Discuss the design issues involved in exception handling. [2]

Total [30]