CSCE 330 Fall 2001
SECOND MIDTERM EXAM–Correction Guide
Wednesday 1/11/7—50 points
Closed Book, Except for FP Handout

1 Short Answer Questions–10 points

1. (1 point) Pcode is an example of intermediate code. True or false? **Answer:** True—see p.48.
2. (1 point) Suppose that an experienced programmer is using a programming environment that provides both an interpreter and a compiler for a programming language. The programmer will use the compiler while developing a program and the interpreter to generate efficient code after the program has been validated. True or false? **Answer:** False–see p.49: switch "compiler" and "interpreter."
3. (1 point) In a static language, the type a variable is bound to the variable name at program execution ("run") time. True or False? **Answer:** False–at compile time.
4. (2 points) Why do some languages distinguish between the declaration and the definition of a routine? **Answer:** Because of mutual recursion. (Partial credit for: because it encapsulates the interface of a group of related functions, e.g. for methods of a class.)
5. (2 points) Define overloading. **Answer:** See p.68 text.
6. (2 points) What is aliasing? **Answer:** See p.67 text.
7. (1 point) In Simplesem, the effect of the instruction `set 10, D[20]` is to copy the value stored at location 10 of data memory into location 20 of data memory. True or false? **Answer:** False. The reverse is true.

2 Run-time Structure–20 points

(Carlo Ghezzi) Consider the following program fragment.

```
program pippo{
  integer a,b;
  routine gamma(); // declaration of gamma
  routine alpha(){
    integer a, x, y;
    routine beta(){
      integer z, g;
      a = z + x + b;   // (i)
    };
    ......
    x = a + y;  // (ii)
    ......
  };
  routine gamma(){ // definition of gamma
    integer a, x, z, w;
    ......
  };
  ......
};
```

1. (4 points) Draw the static nesting tree for this program. **Answer:** pippo is root; one child of pippo is gamma, which is a leaf; the other child is alpha, which has beta as child. beta is a leaf.

2. (3 points) Compute the distance attribute for the variables that appear in instruction `(i)`. **Answer:** a:1, z:0, x:1, b:2.

3. (3 points) Compute the distance attribute for the variables that appear in instruction `(ii)`. **Answer:** all are zero

4. (10 points) Sketch Simplesem memory, showing static and dynamic links within the activation records, for the following sequence of calls: `pippo` calls `gamma`, which calls `alpha`, which calls `beta`, which calls `gamma`, which calls `alpha`.

3 FP–20 points

1. (4 points) Write a function that tests whether its argument is zero. Call it `iszero`. So, for example, `iszero:1` is `F`, while `iszero:0` is `T`. **Answer:** Not provided: programming assignement question.

2. (4 points) Write a function that determines whether or not the first element of a sequence is zero. Call it `firstzero`. So, for example, `firstzero:<0 4 1>` is `T`, whereas `firstzero:<4 0 1>` is `F`. Your function must use `iszero`. **Answer:** `{firstzero iszero @ 1}`

3. (4 points) Write a function that strips off leading zeros from a sequence. You must use `while` and `firstzero`. **Answer:** `(while firstzero ; tl}`

4. (8 points) Write a function that computes the length of a sequence. Do not use recursion. Do not use `while`. Use composition. (Hint: What is `& %1 : <1 2 3>`?) **Answer:** `!+ @ & %1`