

## Homework 2

Due: April 5, 2012 in class

- 1 (30%) In this exercise, you are to write small programs to compare the efficiency of different storage binding methods. Write three functions in C: one that declares a large array statically, one that declares the same large array on the stack, and one that creates the same large array from the heap. Call each of the functions a large number of times, say 100,000, and output the time required by each. Explain the results.

- 2 (15%) Write a C function `foo()` that includes the following sequence of statements:

```
x = 21;
int x;
x = 42;
```

(1) Run the program and explain the results. (2) Support your explanations by examining the corresponding assembly code.

- 3 (20%) Write a C function `foo()` that includes the following sequence of statements.

```
int jj = 5;
int foo(int x)
{ int j = 10;
  if (j < x)
    { int j = jj; /* a new block */
    } else
    { j = jj;
    }
  return j+x;
}
```

(1) What value will be returned if we call `foo(12)`? (2) How about we call `foo(8)`? (3) Examine the corresponding assembly code and explain how the new block is translated.

- 4 (35%) Consider the following program:

```
procedure Main is
  X, Y, Z : Integer;
  procedure Sub1 is
    A, Y, Z : Integer;
    procedure Sub2 is
      A, B, Z: Integer;
      begin ... end -- of Sub2
    begin ... end - of Sub1
  procedure Sub3 is
    A, X, W : Integer;
```

```
begin ... end; -- of Sub3  
begin ... end -- of Main;
```

(1) List all the variables, along with the program units where they are declared, that are visible in the bodies of Sub1, Sub2, and Sub3, assuming static scoping is used.

(2) Given the following calling sequences and assuming that dynamic scoping is used, what variables are visible during execution of the last subprogram activated? Include with each visible variable the name of the unit where it is declared:

Main calls Sub3; Sub3 calls Sub1; Sub1 calls Sub2