

CS 410: Homework 4

Fall 2006 [Bono]

Due: Wed., November 15, 2006, start of class

Problem 1

Note: For this problem use the style of pseudo-code we used in the lectures on code generation with a stack machine. To remind you, in that style, we intermixed the recursive calls with the generated MIPS code. Your code must also use the stack discipline (i.e., so that it would work together with the code we discussed in class for the other expressions). You may also use the `push`, `pop`, and `top` shorthand we used in class. For any run-time constants in the generated code, include comments explaining how the value would be computed at compile-time.

Problem: Write a code-generation routine for a new infix operator **min**. `Min` returns the minimum of its two integer operands. Here is an example of its use

```
int minVal = (4*y+7) min (x+g);
cout << (10 min 20); // prints 10
```

```
cgen( e1 min e2 ) =
```

(HW 4 continues on the next page.)

Problem 2

Consider the following classes for a C++ program.

```
class Foo {
public:
    virtual void meth1();
    virtual void meth2();
    . . .
};

class Bar : public Foo {
public:
    virtual void meth2();
    virtual void meth3();
    . . .
};

class Blob : public Bar {
public:
    virtual void meth1();
    virtual void meth3();
    virtual void meth4();
    . . .
};
```

Part A. Recall that to do code generation for virtual function binding correctly we need some runtime data structures called method tables. Show the contents of the method tables for classes `Foo`, `Bar`, and `Blob`. Assume we are using the following naming scheme:

- o method table for class `x` is located at address denoted by label `x_methTab`
- o method `y` defined in class `x` is located at address denoted by label `x.y`

Part B. For the following method call, circle the exact entry in the exact table that is used when we run the generated code. That is, circle the correct entry from your answer to part A.

```
Foo *p = new Bar();
p->meth1();
```

Part C. If we change the above code to the code below (the part that changed is shown in italics), it will no longer compile. What is the error and what part of the compiler would catch the error?

```
Foo *p = new Bar();
p->meth3();
```