CS/CoE 1622: Introduction Compiler Design

Homework #3

Due Time: April 20th, 2016

1. (16 points) Brief answers

   a) Why do we want to generate machine-independent 3-address code?
   b) Compare the advantages and disadvantages of static and stack storage management.
   c) What is the purpose of using control link and access link respectively?
   d) How to translate (1) global, (2) local and (3) non-local variables.

2. (12 points) Write syntax directed translation rules using (1) two pass approach; and (2) one pass (**backpatching**), respectively, for

   S1 → do { if (E1) then S2 } while (E2);

3. (10 points) Suppose we have the following program

```
int a=10, b=3;
procedure P1 (parameter x, parameter y)
{
   int b=2;
   x:= x+y;
   a:= a+b;
   y:= a+4;
}
procedure main()
{
   P1(a,b);
   printf("a=%d b=%d", a, b);
}
```

   What are the outputs if the parameter passing scheme is

   a) call by value;
   b) call by reference;
   c) call by value-result (i.e. copy and restore);

4. (12 points) For dynamic storage management

   a) What is considered as garbage?
   b) Using an example to explain the reason why reference counting can't handle a circular data structure if it becomes garbage.
   c) Why is the mutator time of copy-based collectors (such as semi-space and generational collectors) better than that of reference-counting based collectors?
   d) Why is the garbage collection time of generational collectors better than that of semi-space or mark-sweep?