Comp 356 Homework Assignment 2

1 (5 pts) Suppose that for a particular C++ compiler, the size of an int in memory is 4 bytes, a pointer to char is 4 bytes and a double is 8 bytes. How much memory is required for a variable of the following struct? You may assume all structs are placed contiguously in memory.

typedef enum {ceo, manager, staff} employeeTag;

typedef struct{

char\* name;

double salary;

char\* address;

employeeTag tag;

union {

struct{

double goldenParachuteValue;

int numberOfHouses;

} ceoFields;

struct{

char\* deparment;

int teamSize;

} managerFields;

struct {

char\* deparment;

int hireYear;

char\* speciality;

} staffFields;

} emp;

} employeeType;

2. (8)Consider the following C++ program:

int main(){

int\* p1;

int\* p2;

int\* p3;

int i = new int;

p3 = &i;

p1 = p3;

p2 = new int;

p1 = p2;

delete(p1);

}

1. Does the program create any garbage? Why or why not?
2. List all pointers that are dangling after the execution of delete(p1);

3. (10) What are the relative advantages and disadvantages of garbage collection as compared to explicit deallocation of memory?

4. (10) Consider the following BNF definition of statements for a programming language: (Example 3.6 in the book may be helpful)

<stmt> -> <assign-stmt> ;

<assign-stmt> -> <var> = <expr>

<var> -> d | e | f | i

<expr> -> <var> | <expr> + expr> | <expr> \* <expr> | <assign-stmt>

1. Draw a parse tree for the statement: e = d = f + i;
2. Annotate each non terminal in the parse tree with its actual type using the typechecking rules of Java. Assume the following intrinsic type attributes have already been assigned: d and e are type double, f is type float, and i is type int.
3. Are there any nodes where the expected type differs from the actual type? If so, would any compilation errors result in Java?