Mid-term examination for Object Oriented Programming

The College of Computer Science

Name (in Chinese): _____ Student ID number: _____

I. True or false (20%)

1) A program is a bunch of objects telling each other how to do by sending messages.
2) sizeof(int) should be 4 in a machine where the width of the data bus is 32-bit.
3) Destructors can be overloaded.
4) A friend function is not a member function.
5) The index of an array of pointers to objects begins with 1.
6) Class can have more than one super class.
7) Dynamic binding is used as default binding method in C++.
8) The operator :: can be overloaded.
9) An abstract class is a class with at least one pure virtual function.
10) An object file generated by a C++ compiler can be linked with an object file generated by a C compiler.

II. Multiple choice (24%)

1. Which one is NOT one of the characteristics of OOP?

A) Overload
B) Object
C) Class
D) Inheritance

2. Given:

```
class A {
    A() {};
    virtual f()=0;
    int i;
};
```

which statement is NOT true:

A) i is private
B) Objects of class A can not be created
C) i is a member of class A
D) sizeof(A) = sizeof(int)

3. Which one is constant of chars:

A) `char* s = "Hello, world!";`
B) `char s[] = "Hello, world!";`
C) `char s = " Hello, world!";`
D) `char s[10] = "Hello, world!";`

4. For the code below:

```
class A {
  static int i;
  //...
};
```

Which statement is true?

A) All objects of class A reserve a space for i
B) All objects of class A share the space of i
C) Once one object of class A changes the value of i, all other objects of class A can receive a message and change their own copy of I therefore

5. Given:

```
template < class T >
void swap( T& x, T& y ) {
  T temp = x;
  x = y;
  y = temp;
}
int i,j;
float f,m;
```

Which statement is incorrect?

A) `swap(i,j);`
B) `swap(j,i);`
C) `swap(f,m)`
D) `swap(i,f);`

6. Given:

```
cout << “Start…”;
try {
 cout <<”Hello there!”;
 throw new FileNotFoundException();
}
cout << “ Caught here!”;
catch(EOFException* p) {
 cout << “End of file reached!”;
}
```

```
catch(FileNotFoundException* p) {
 cout << “File not found!”;
}
```

EOFExceotion and FileNotFoundException are both classes defined anywhere else. Assuming this block of code is placed into a function, which statement is most true concerning this code?

A) The code will not compile.

B) The code will print `Start…Hello there!File not found!`

C) The code will print `Start…Hello there!End of file reached!`

D) The code will print `Start…Hello there!Caught here!`

III. Answer the questions (40%)

1. Describe the meaning of each line of definition of variable: (6%)

```
a) const int * p;
b) int const * p;
c) int* const p;
```

2. What is the difference between the two sections of the code below? (5%)

a)
```
Person funca( char *who ) {
  Person local( who );
  local.print();
  return local;
}
```

b)
```
Person funcb( char *who ) {
  return Person( who );
}
```

3. Tell the difference between delete and delete[].(5%)

4. Given: (8%)

```
class Tree {
  int height;
public:
  Tree(int initialHeight);
  ~Tree();
  void grow(int years);
  void printsize();
};

Tree::Tree(int initialHeight) {
  height = initialHeight;
```

```
}

Tree::~Tree() {
  cout << "inside Tree destructor" << endl;
  printsize();
}

void Tree::grow(int years) {
  height += years;
}

void Tree::printsize() {
  cout << "Tree height is " << height << endl;
}

int main() {
  cout << "before opening brace" << endl;
  {
    Tree t(12);
    cout << "after Tree creation" << endl;
    t.printsize();
    t.grow(4);
    cout << "before closing brace" << endl;
  }
  cout << "after closing brace" << endl;
}
```

What is printed to the output?

5. Given: (8%)

```
#define CLASS(ID) class ID { \
public: \
  ID(int) { out << #ID " constructor\n"; } \
  ~ID() { out << #ID " destructor\n"; } \
};

CLASS(Base1);
CLASS(Member1);
CLASS(Member2);
CLASS(Member3);
```

```
CLASS(Member4);

class Derived1 : public Base1 {
  Member1 m1;
  Member2 m2;
public:
  Derived1(int) : m2(1), m1(2), Base1(3) {
    out << "Derived1 constructor\n";
  }
  ~Derived1() {
    out << "Derived1 destructor\n";
  }
};

class Derived2 : public Derived1 {
  Member3 m3;
  Member4 m4;
public:
  Derived2() : m3(1), Derived1(2), m4(3) {
    out << "Derived2 constructor\n";
  }
  ~Derived2() {
    out << "Derived2 destructor\n";
  }
};

int main() {
  Derived2 d2;
}
```

What is the output of the code?

6. Given: (8%)

```
class B {
public:
    void f() { cout << “B::f(); } ;
}
class D : public B {
public:
    void f() { cout << “D::f(); } ;
```

```
}
main() {
    D d;
    d.f();
}
```

What will be printed out?

For IV and V, you should answer only one of them. If you left answers to both questions, you must specify which one to be counted into the final score. Otherwise, I will choose the worse one.

IV. Write a program to represent a class of complex. Copy constructor, operators +, = and == must be realized. (16%)

V. Your parents are thinking of opening a video rental store. Because they are helping with your tuition, they ask you to write a program to handle their inventory.

What are the major objects in a rental store? They are the items to be rented and the people who rent them. You begin with the abstraction of the items to be rented – videotapes. To determine the characteristics of a video object, you jot down a list of questions:

- Should the object be one physical video tape, or should it be a title (to allow for multiple copies of a video)?
- What information about each title or videotape should be kept?
- Should the object contain a place for the card number of the person who has it rented?
- If there are multiple copies, is it important to keep track of specific copies?
- What operations should a video object be able to execute?

Answer these questions and give complete reasons to each question. After that, write the definition code of the classes. (16%)