2014.2 Object-Oriented Programming and Design
Final Exam (Dec. 18th 7pm-8:20pm)

supervisor signature	

StudentID# : ( ) , Name : ( )

* You may answer in either Korean or English. As an exception, you can use only English words in problem 1.

1. (24 points) Complete following sentences by filling out blanks (a)~(l) with the most appropriate English words.

You can use only English words in this problem 1. Otherwise, you will get some penalty.

(1) (a.) member variables of a class are shared by all instances of the class.

(2) In a package diagram, packages are usually organized to maximize (b.) within each package and to minimize (c.) among packages.

(3) In STL, a container manages storage space for its elements and provides member functions to access them, either directly or through (d.).

(4) Advantage of dynamic binding:
dynamic binding allows us to (e.) new classes to existing systems without (f.).

(5) An abstract class can only be used as (g.), and should contain (h.) function.

(6) UML uses (i.) notation: clearer than natural language and code.
UML is not (j.) any one language or technology.

(7) IS-A relationship: Say “A is-a B”. If it sounds right to your ear, then A can be made as a (k.) of B.

(8) One of the main disadvantage of inheritance is increased (l.) between classes.

2. (12 points) Is following statement true or false? Choose the correct answer with circle-marking and explain.

(1) One of the main advantage of inheritance is increased execution speed (high efficiency).

Ans: (True / False),
If ‘True’, explain why using inheritance can increase execution speed.
( )

If ‘False’, explain why increasing execution speed is not advantage of inheritance.
( )

(2) The speeds(time complexities) of push_front() and push_back() operations in STL list are equivalent.

Ans: (True / False),

If ‘True’, what is the time complexity of push_front() operation in STL list? ( )

If ‘False’, explain why not equivalent.
( )

(3) size() member function of STL vector returns the size of the storage space currently allocated for the vector.

Ans: (True / False),

If ‘True’, no explanation is necessary.

If ‘False’, modify above statement into correct statement. Only one or two words can be modified for your correction.
( )

3. (14 points) STL vectors use continuous storage space for their elements.
(a) What is the main advantage of using continuous storage space?
Explain with the most important advantage. Your answer can contain at most 15 English or Korean words.
( )

(b) What is the main disadvantage of using continuous storage space? Your answer should contain explanation on when such disadvantage occurs. Your answer can contain at most 15 English or Korean words.
( )

3. (14 points) We want that **print_max()** function takes two arguments and prints the value of the bigger argument as shown in the main function and output result of following C++ code. However, the C++ code below is wrong.

(a)

```
#include <iostream>
using namespace std;
template<typename T>
void print_max(const T& a, const T& b)
{
   cout << ((a>b) ? a:b) << endl;
}
```

```
int main() {
   print_max(4, 5.5);
   print_max(3.2, 1);
   return 0;
}
```

```
output :
5.5
3.2
```

(c)

// Write your modified **print_max** function here.

(1) Explain why above code generates compile error. (   )

(2) In order to make above code correct, modify the **print_max** function in (a). Write your modified **print_max** function in blank (c).

4. (16 points) Write a C++ function "Swap" that takes two parameters x and y, and swaps the values of the two parameters (meaning it assigns the value of x to y and the value of y to x). Note that the types of **x** and **y** are the same but the type is a generic type. Therefore, <u>you must use template</u> to write the "Swap" function that can accept any built-in type of parameters as shown in the following sample code and its output result.

```
#include <iostream>
int main()
{
   int a=3, b=4;
   float c=3.5 , d=2.3;
   Swap(a,b);
   Swap(c,d);
   std::cout << a << "," << b << "," << c << "," << d << "\n";
   return 0;
}
```

```
output :
4,3,2.3,3.5
```

(Write your Swap function here using template.)

5. (20 points) What is the output of the following C++ program to the screen?

```
#include <iostream>
using namespace std;

class B {
public:
  B() { z=-5;  cout << “B(): z=” << z << endl; }
  B(int z_val) : z(z_val) { cout << “z=” << z << endl; }
  virtual int get_val() { return (z-1); };
  int gv2() { return (z-2); }
private :
  int z;
};

class D1 : public B {
public:
  D1() { x=7; cout << “D1(): x=” << x << endl; }
  D1(int x_val): x(x_val) { cout << “x=” << x << endl; }
  virtual int get_val() { return x; };
  int gv2() { return x+1; }
private:
  int x;
};

class D2 : public B {
public:
  D2() { y=2; cout << “D2(): y=” << y << endl; }
  D2(int y_val): y(y_val) { cout << “y=” << y << endl; }
  int get_val() { return y; }
  virtual int gv2() { return y*y; };
private:
  int y;
};
```

```
int main()
{
  B Zero(0);   D1 Two;   D2*  d2ptr;
  B* B_ptrArray[2];
  B_ptrArray[0] = &Zero;
  B_ptrArray[1] = &Two;
  d2ptr = new D2 ;

  cout << "0 : " << B_ptrArray[0]->get_val() << endl;
  cout << "1 : " << Two.get_val() << endl;
  cout << "2 : " << Two.gv2() << endl;
  cout << "3 : " << B_ptrArray[1]->get_val() << endl;
  cout << "4 : " << B_ptrArray[1]->gv2() << endl;
  cout << "5 : " << d2ptr->gv2() << endl;
  cout << "6 : " << d2ptr->get_val() << endl;

  delete d2ptr;
  return 0;
}
```

Output : (PUT YOUR ANSWER HERE)