THE HONG KONG POLYTECHNIC UNIVERSITY
Faculty of Engineering

Computer Programming Closed-book Written Test 2
Date: 8 December 2006 Time: 3:00 – 4:00pm

Name: _____ Student No. _____
Programme:_____

This test aims at assessing students on the following learning outcomes:

1. Familiarize themselves with Visual Studio 2005 environment
2. Be proficient in using the basic constructs of C/C++
3. Develop a structured and documented computer program
4. Understand the fundamentals of object-oriented programming and apply it in computer program development.

Every question belongs to one of the three levels of difficulties:

- Knowledge reflected in the learning outcomes
- Application of knowledge that exceeds the learning outcomes in the majority of regards
- Extrapolation of knowledge that exceeds the learning outcomes in all regards

Grading:

0 - 11 marks	F	12 - 22 marks	D, D+
23 - 34 marks	C, C+	35 - 48 marks	B, B+
49 - 60 marks	A, A+		

Instruction: *Choose only ONE answer for each question* ***unless stated otherwise****. Choose the answer(s) by circling it/them. Each question carries 2 marks. The total marks are 60.*

Q1 Which of the following description(s) about pointers in C++ is/are correct?

(i) A pointer must store an address.
(ii) The declaration "`int * p = 2;`" is a valid C++ statement that can be compiled successfully.
(iii) The declaration "`int pa[10];`" will lead to the creation of a variable pointer named `pa`.

a) (i) b) (ii) c) (iii) d) (i), (ii) and (iii) e) None of the above.

2A

Q2 Consider the following declarations of variables:

```
int Foo = 0;
int *ptr = &Foo;
```

Which of the following statements will change the value of `Foo` to 1? (*You may choose more than one answer.*)

a) `ptr++;` b) `Foo++;` c) `(*Foo)++;` d) `(*ptr)++;` e) `Foo+1;`

2K

Q3 Which of the following can be returned by the destructor of an object? (*You may choose more than one answer.*)

a) An integer b) An array's name c) A pointer d) An object

e) None of the above.
(A destructor returns nothing.)

2A

Q4 In C++, which character should end a character array?

a) `'\0'` b) `''` c) `' '` d) `'0'` e) `'\n'`

2K

Q5 A class `SomeClass` has a member function `F` that requires no input parameter, returns a pointer to an integer data, and does not modify the value of any of the private variable in the class. Which of the following can be the correct name of the function when implementing it in a `.cpp` file??

a) `int * F() const` b) `const int * F()` c) `SomeClass::int *F() const`

d) `int * SomeClass::F() const` e) `const int * SomeClass::F()`

2K

Q6 The names of the header file and the .cpp file for building a static library are `myclass.h` and `myclass.cpp` respectively. The name of the source file that applies this static library is `testmain.cpp`. Which of the following file(s) should include the file `myclass.h`?

a) `myclass.h` only b) `myclass.cpp` only c) `testmain.cpp` only

d) `myclass.cpp` and `testmain.cpp` e) `myclass.h`, `myclass.cpp` and `testmain.cpp`

2K

Q7 Which of the following are valid C++ statements? (*You may choose more than one answer.*)

a) `char a=new char[20];`

b) `char *a=new char[20];`

c) `char a=new char(20);`

d) `char *a=new char;`

e) `char *a=new char(20);`

2K

Q8 What will be printed on the output screen when the following lines of C++ code are executed?

```
int x = 10,y = 20;
{
      int temp, x = 30, y = 40;
      temp = x;
      x = y;
      y = temp;
}
cout<<x<<','<<y<<endl;
```

a) `10,20` b) `30,40` c) `40,30` d) Unknown as it has compilation error(s)

e) Unknown as this program produce a run-time error during execution.

2K

Q9 Which of the following gives the memory address of the second element in the array `abc[]`, which is an array with 100 elements?

a) `abc[1]` b) `abc` c) `abc[2]` d) `&abc[3]` e) `abc+1`

2K

Q10 Which of the following description(s) is/are correct?

(1) To store a large amount of big objects, the method of "Pointer of Array" requires more memory than the method of "Array of Pointers".
(2) If we convert a stray pointer to a null pointer after a `delete` statement, we can ensure that no run-time error will occur even if we accidentally modify the data pointed by the null pointer.
(3) When we use the method of "Pointer of Array" to store a large amount of big objects in the heap, the array is in the heap.

a) (1) only b) (2) only c) (3) only d) All (1), (2) and (3)

e) None of the above.

2K

Q11 Assume that the following line of C++ code can be executed:

```
cat *CAT = new cat(2);
```

Which of the following description(s) can be TRUE? (*You may choose more than one answer.*)

a) `CAT` must be an object. b) `CAT` must take one input parameter. c) `CAT` is a variable.

d) `cat` must be stored in the stack e) `CAT` must be a function that will return an address.

2A

Q12 On executing the C++ program below, what will be shown on the output screen?

```
#include <iostream>
using namespace std;
int main()
{
      char string1[] = "Programming.";
      char string2[] = "C++";
      cout<<strlen(string1)<<", ";
      cout<<strlen(string2)<<", ";
      strncpy(string1,string2,4);
      cout << string1 << endl;
      return 0;
}
```

a) `13, 4, C++` b) `13, 4, Programming.` c) Unknown as a run-time error will occur

d) `12, 3, Programming.` e) `12, 3, C++`

2K

Q13 Consider the following class declaration:

```
class MyClass
{
public:
      MyClass ( );    // Private variable priv initialized to zero
      MyClass (int n);     // Private variable priv initialized to n
private:
      int priv;
};
```

Assume that inside a function, an object is instantiated by the statement "`MyClass gamma (5);`". What will be the value of `priv` in `gamma`?

a) Unknown as the class declaration contains error(s) b) 0 c) 5 d) `n`

e) Some uninitialized random value.

2K

Q14 Consider the following lines of C++ code:

```
int a=21, b=3, c=2;
double d= 4.0;
b=a/c;
{int b=4;}
cout<< b*c <<' ' << (a/d)%c << endl;
```

Which of the following could be the output shown on the screen?

a) `20 1` b) `21 1` c) `8 1`

d) No output because the code will lead to compilation error(s) e) None of the above.

2A

Consider the following C++ program and answer **Q.15 and Q16.**

```
#include <iostream>
using namespace std;
class Object
{
public:
      Object(int i) {count = new int(i);}  //An integer is stored in the heap
      int *GetPnt () const {return count;} //Returns an address
      int GetCnt () const {return *count;} //Returns the integer's value
private:
      int *count;
};

int main()
{
      for (int i=0; i<10; i++)
      {
            Object * Obj = new Object(i);
            cout << Obj->GetCnt() << endl;  //Line 18
            delete Obj;
      }
      return 0;
}
```

Q15 Which of the following that replaces **`Line 18`** above will produce the same output?

a) `cout << *(Obj->GetPnt()) << endl;`

b) `cout << &(Obj->GetPnt()) << endl;`

c) `cout << *(&(Obj->GetCnt())) << endl;`

d) `cout << *(&(Obj->GetPnt())) << endl;`

e) None of above.
('`&`' requires l-value)

2E

Q16 In **`Line 18`**, `Obj->GetCnt()` can also be replaced by which of the following? (*You may choose more than one answer.*)

a) `(&Obj).GetPnt()` b) `*((*Obj).GetPnt())` c) `(*Obj).GetCnt()`

d) `*(Obj->GetPnt())` e) None of the above.

2K

Q17 On executing the C++ program below, what will be displayed on the output screen?

```
#include <iostream>
using namespace std;
class CAT
{     public:
            CAT() {cout<<"Created"<<", ";}
            ~CAT() {cout<<"Destroyed"<<", ";}
};
int main()
{
      for(int i=0; i<3; i++)     {
            CAT hello;}
      return 0;
}
```

a) `Created, Destroyed, Created, Destroyed, Created, Destroyed,`

b) `Created, Created, Created, Destroyed, Destroyed, Destroyed,`

c) `Created, Created, Created,` d) `Created, Destroyed,` e) None of the above.

2K

Q18 Consider the following lines of C++ code:

```
int main()
{
      char str[3][10] = {"one", "two", "three"};      //line 1
      cout  <<str[0]<<endl                            //line 2
            <<str[1]<<endl                            //line 3
            <<str[2]<<endl;                           //line 4
}
```

Which of the following statement(s) can replace `line 1` to give the same output?

a) `char str[][] = {"one", "two", "three"};`

b) `char *str[] = {"one", "two", "three"};`

c) `char str[] = {"one", "two", "three"};`

d) `char *str = {"one", "two", "three"};` e) None of the above.

(`char *a="hello";` is valid)

2E

Q19 Which line of the following class declaration contains a syntax error?

```
class A                          //Line 1
{                                //Line 2
      public:                    //Line 3
            int F();             //Line 4
      private:                   //Line 5
            int n;               //Line 6
}                                //Line 7
int A::F() {
      ⋮
```

a) `Line 1` b) `Line 4` c) `Line 6` d) `Line 7` e) None of the above.

2K

Consider the following C++ program and answer Q.20 and Q21.

```
#include <iostream>
using namespace std;
int main ()
{
      int *p1 = new int(2);      //An integer of value 2 is stored in heap
      int *p2 = &(*p1);
      p1=0;
      p1 = new int(6);
      cout << *p1 <<','<< *p2 <<endl;
      delete p1;
      return 0;
}
```

Q20 Which of the following could be the output shown on the screen on executing the above program?

a) `-842150451,2` b) `6,2` c) `6,-842150451`

d) No output but a run-time error message will be generated. e) None of the above.

2K

Q21 Will there be memory leak on executing the above program? If yes, how many bytes of memory have not yet been freed?

a) No memory leak will occur. b) 4 bytes are not freed. c) 8 bytes are not freed.

d) 12 bytes are not freed. e) Unknown because a run-time error will halt the execution.
(One integer in the heap is not freed.) 2E

Q22 Consider the compilation of the following C++ code:

```
int data[10];
data={1,2,3};
```

Which of the following description(s) is/are correct? (*You may choose more than one answer.*)

a) Compilation errors will be reported. b) The array `data[]` has 3 elements.

c) `data[]` has 10 elements with the last 7 elements' values being uninitialized.

d) `data[]` has 10 elements with the last 7 elements being equal to 0. e) None of the above.

2A

Q23 Consider the following C++ program to be built by Visual Studio 2005:

```
#include <iostream>
using namespace std;
void main()
{
      char s1[20] = "Peter, Paul";
      char s2[10] = "Mary";
      char s3[50];
      cout << strcat (strcat(strcpy(s3,s1), " and "), s2)<<endl;
}
```

Which of the following about compiling and executing the above program is correct?

a) Compilation errors will be reported. b) No compilation error but a run-time error occurs.

c) Some random characters will be shown on the screen.

d) The screen will show: `Peter, Paul and Mary` e) None of the above is correct.

2K

Consider the following program when answering **Q24 – Q26**.

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

void push(int *ip, int *store, int data)  //Requires 2 pointers and 1 int
{
     store[(*ip)] = data; //*ip and store[] are passed by reference
     (*ip)++;   //*ip and store[] are returned by push()
}
int pop(int *ip, int *store)    //Requires 2 pointers as input parameters
{
return store[--(*ip)];     //*ip and store[] are also returned by pop()
}

int main()
{
     int index=0;
     int *sp=new int[10];
     push (&index, sp, 13);     //index and sp[] are passed by reference
     push (&index, sp, 23);     //23 is passed by value
     push (&index, sp, 33);
     cout<<pop(&index, sp)<<",";
     cout<<pop(&index, sp)<<",";
     cout<<pop(&index, sp)<<",";
     cout<<endl;
     delete [] sp;//line 25
     return 0;
}
```

Q24 On executing the C++ program above, what will be displayed on the output screen?

a) `33,23,13,` b) `13,23,33` c) `3,2,1,` d) `1,2,3` e) None of the above.

2A

Q25 Before executing `line 25`, how many bytes of memory are reserved in the free store?

a) 3 b) 10 c) 40 d) 12 e) None of the above.

2K

Q26 Without calling the `pop()` function, at most how many times can the `push()` function be called within `main()` so as not to introduce any run-time erorr?

a) 3 b) 9 c) 10 d) 11 e) None of the above.

2E

Q27 Consider the following C++ declaration:

```
enum Cities {MACAU, HK, SHANGHAI} ;
bool sunny [ 3 ] [ 31 ];
```

Based on the above declarations, which of the following is/are valid C++ statement that will not generate any error or warning message during compilation? (*You may choose more than one answer.*)

a) `sunny[3][true] = SHANGHAI;`

b) `sunny[true][SHANGHAI] = 19;`

c) `sunny[2][SHANGHAI] = true;`

d) `sunny[SHANGHAI][19 ] = true;`

e) `sunny[SHANGHAI][true] = 19;`

2A

Q28 What will be shown on the output screen if the following C++ program is executed?

```
#include <iostream>
using namespace std;
void afunction(int *x)
{
      x=new int;
      *x=12;
      cout<<*x<<", ";
}
int main()
{
      int v=10;
      afunction(&v);
      cout<<v;
}
```

a) Nothing as the program contains error(s) b) `10, 10` c) `10, 12`

d) `12, 12` e) `12, 10`

2E

Q.29 On executing the C++ program below, what will be shown on the output screen?

```
#include <iostream>
using namespace std;
int main()
{
      int hello=100;
      int *pointer1,*pointer2;
      pointer1=0;
      pointer2=0;
      pointer1=&hello;
      pointer2=&hello;
      *pointer1 = 20;
      *pointer2 = 30;
      cout<<*pointer1<<","<<*pointer2<<endl;
      return 0;
}
```

a) `100,100` b) `20,30` c) `30,30` d) `20,20` e) None of the above.

2K

Q30 What will be shown on the output screen if the following C++ program is put to execution?

```
#include <iostream>
using namespace std;
int main()
{
      int i = 5;
      int test[i];
      for (i=0;i<5;i++)
            test[i]=i+2;
      for (i=0;i<5;i++)
            cout<<test[i]<<",";
      return 0;
}
```

a) No output as the program contains error(s). b) `0,1,2,3,4,` c) `1,2,3,4,5,`

d) `2,3,4,5,6,` e) `2,4,6,8,10,`

2E

- End -