

Object oriented programming

Task1 (16):	Task2 (16):
Task3 (16):	Task4 (16):
Task5 (16):	Task6 (20):

Task1	Task2	Task3	Task4	Task5	Task6	Task7	Sum

Task 1: What is the output of the following program?

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

#define MAXOP(a,b) a>b ? a : b
#define DIVOP(a,b)  a/b
#define MNOP(a)    a*a

class B;

class A {
    unsigned i;
public:
    A(unsigned);
    void foo(void) {
        cout << "\nFunction";
    }
    friend int f(A&, B&);
};

A::A(unsigned j) : i(j) { }

class B {
    unsigned i;
public:
    B(unsigned);
    void(A::*ptr)(void);
    friend int f(A&, B&);
};

B::B(unsigned j):i(j){}

int f(A& a, B& b)
{
    int x = 3;
    return MAXOP(a.i + x, x + b.i)*DIVOP(a.i + 4, 2+ b.i);
}

int main()
{
    B xx(7);
    A yy(5);
    void(A::*ptr2)(void);
    ptr2=&A::foo;
    cout << f(yy, xx);
    (yy.*ptr2)();
    xx.ptr=&A::foo;
    (yy.*(xx.ptr))();
    return 0;
}
```

Task2: What is the output of the following program?

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

class A {
public:
    int i, j, k;

    A(int l) : k(l), j(k+1), i(j+2) {}
};

class B: public A {
public:
    B( ) : A(2) { }
};

class C: virtual public A {
public:
    C( ) : A(3) { }
};

void main() {
    C yy;
    B xx ;
    A zz = yy;
    A tt = xx;
    int s = 0;
    for(int i=0;i<10;i++)
    {
        if (xx.i == (xx.j + 1)){
            s+=2;
        }
        else {          s+=3; }

        if (yy.i == (yy.j + 1)){
            s+=20;
        }
        else {          s+=30; }

        if (zz.i == (zz.j + 1)){
            s+=200;
        }
        else {          s+=300; }

        if (tt.i == (tt.j + 1)){
            s+=-3;
        }
        else {          s+=-2; }

        xx.i = yy.i;
        yy.i = zz.i;
        zz.i = tt.i;
        xx.j = yy.j;
        yy.j = zz.j;
        zz.j = tt.j;

        cout << " " << s << endl;
    }
}
```

Task 3: What is the output of the following program?

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

int id = 0;

class ClassA {
public:
    ClassA() { id = 1;}
    ClassA(int objectNumber) {
        objectID = objectNumber;
        cout << objectID << " constructor" << endl;
    }

    ~ClassA() { cout << id << " destructor" << endl;}

private:
    int objectID;
};

static void create( void );

static ClassA a(id++);

class CD1 : virtual public ClassA {
public:
    CD1(): ClassA(id) {ClassA b(id);}
    ~CD1() {ClassA b(id++); }
};

class CD2 : public ClassA {
    CD1 a;

public:
    CD2(int i) : ClassA(i) {}
    virtual ~CD2() { ClassA b(id++); }
};

class CD3 : virtual public CD1, public CD2 {
public:
    CD3(int i) : CD1(), CD2(i) { static ClassA a(i);}
};

void main( ) {
    ClassA b(id++);
    static ClassA c(id++);
    CD3 a(id);
    create();
    ClassA f(id++);
}

void create( void ) {
    ClassA a(id++);
    static CD2 b(id++);
    CD1 c;
}
```

Task 4: What is the output of the following program?

```
#include "stdio.h"

class BaseClass {
    int id;
public:
    BaseClass() { printf("BaseClass()\n"); }
    virtual ~BaseClass() { printf("~BaseClass()\n"); }
};

class Class1 : public BaseClass
{
    int id;
public:
    Class1() { printf("Class1()\n"); }
    ~Class1() { printf("~Class1()\n"); }
};

class Class2 : public Class1
{
    BaseClass id;
public:
    Class2() { printf("Class2()\n"); }
    ~Class2() { printf("~Class2()\n"); }
};

class Class3 : virtual public BaseClass
{
    int id;
public:
    Class3() { printf("Class3()\n"); }
    ~Class3() { printf("~Class3()\n"); }
};

class Class4 : public Class3, virtual public Class1
{
    Class3 id;
public:
    Class4() { printf("Class4()\n"); }
    ~Class4() { printf("~Class4()\n"); }
};

int main(int argc, char* argv[])
{
    BaseClass *p = new Class2;
    Class2 *p1 = new Class2;
    Class3 *p2 = new Class3;
    delete p;
    delete p1;
    delete p2;

    return 0;
}
```

Task 5: What is the output of the following program?

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

static int b;
class X {
    int *pi;

public:
    int x;
    virtual int a();
    int bb();
    void operator() (X& x);
    X(){b=0; x=5;};
    X(int i) : pi(new int(i)) {b++;}
    X(const X &x) : pi(new int(*x.pi)) {b*=2;}
    X& operator= (const X&);
};

X& X::operator= (const X& x) {
    if (this != &x) {
        delete pi;
        pi = new int(*x.pi);
    };
    return *this;
}

int X::a(){cout << "X A\n";this->x;return bb();}
int X::bb(){cout << "X B\n";return this->x;}
void X::operator() (X& x){
    this->x = x.a() * x.bb();
    cout << this->x << endl;
}

class Derived: public X{
public:
    int a();
    int bb();
};

int Derived::a(){ cout << "Derived A\n";return bb()*10;}
int Derived::bb(){ cout << "Derived B\n";return this->x * 2;}

X funF(X x){X Xnew(5); x=Xnew; return x;}

void g() {
    X xa=4, xb=3;
    X xc = xa;
    xa = funF(xb);
    xc = xa;
}

int main(int argc, char* argv[]){
    X d();
    X obj;
    X *dd = new Derived();
    obj.a(); dd->a(); obj.bb();
    dd->bb(); obj(*dd); (*dd)(obj);
    g();
    cout << b << endl;
    return 0;
}
```

Task 6: What is the output of the following program?

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

int data = 0;

class Y;

class X {
public:
    X(){cout << "cX" << endl; data++;}
    ~X(){cout << "dX" << endl; data--;}

    X& operator++( ) { cout << "1 " << data-- << endl; X* b = new X; return *b;}
    X operator++(int) { cout << "2 " << data++ << endl; X* b = new X; return *b;}
    X& operator--( ) { cout << "3 " << ++data << endl; X* b = new X; return *b;}
    X operator--(int) { cout << "4 " << --data << endl; X* b = new X; return *b;}
    void operator+(X& b) { data++;}

};

class B
{
public:
    virtual void f(int d = 3) = 0;
};

class Y : public X, public B {
public:
    Y(){cout << "cY" << endl;}
    ~Y(){cout << "dY" << endl;}
    void f(int d = 5) { X a; a++; data+=d--;;}
};

class Z : public Y {
public:
    Z(){cout << "cZ" << endl;}
    ~Z(){cout << "dZ" << endl;}
};

Y retZ(Y s){ return s; }

const Y& retX(const Y& p){return p;}

Y retY(Y s){ return s;}

int main(int argc, char* argv[])
{
    Z Teslic;
    X i, j;

    retZ(retY(retX(Teslic)));
    B *b = new Y;
    ++--j++--j++;
    b->f(data);
    return 0;
}
```

Rešenja i način bodovanja:

Zadatak 1:

47
Function
Function

16 poena integralno

Zadatak 2:

219
438
657
876
1095
1314
1533
1752
1971
2190

16 poena integralno

Zadatak 3:

0 constructor
1 constructor
2 constructor
1 constructor
1 destructor
3 constructor
1 constructor
1 constructor
1 destructor
3 constructor
1 constructor
2 constructor
3 constructor
3 constructor
3 destructor
3 constructor
3 constructor
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4 destructor
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8 constructor

9 destructor
9 constructor
10 destructor
10 destructor
10 destructor
10 destructor
10 destructor
10 destructor

16 poena integralno

Zadatak 4:

BaseClass()
Class1()
BaseClass()
Class2()
BaseClass()
Class1()
BaseClass()
Class2()
BaseClass()
Class3()
~Class2()
~BaseClass()
~Class1()
~BaseClass()
~Class2()
~BaseClass()
~Class1()
~BaseClass()
~Class3()
~BaseClass()

16 poena integralno

Zadatak 5:

X A
X B
Derived A
Derived B
X B
X B
Derived A
Derived B
X B
500
X A
X B
X B
250000
18

16 poena integralno

Zadatak 6:

cX

cY

cZ

cX

cX

dY

dX

dY

dX

dY

dX

cX

cY

$2 \cdot 1$

cX

$2 \cdot 3$

cX

$4 \cdot 4$

cX

$3 \cdot 6$

cX

$1 \cdot 7$

cX

dX

dX

dX

cX

$2 \cdot 6$

cX

dX

dX

dX

dX

dZ

dY

dX

20 poena integralno