Final Exam

1/12/2000

1. (10%)Explain briefly

a. operator overloading; b. function overloading; c. protected data member;
d. conversion constructor; e. static variable

2. (5%) Please output the following program.

```
#include <iostream.h>
class CA1 {
  public:
    CA1 (int val) { data = val;}
    int operator! (){ return data;}
    CA1 &operator- () { --data;
                        return *this;}
  private:
    int data;
};
void main()
{
  CA1 ex(20);
    cout << !ex << endl;
    cout << !(-ex) << endl;
    cout << !(-(-ex)) << endl;
}
```

3. (15%) Please output the following program.

```
#include <iostream.h>
#include <string.h>
class CA2
{
  friend int & func(int &);
  public:
    CA2(const char* = " ");
    CA2(const CA2 &);
   ~CA2();
  private:
    char month[20];
```

```
};
CA2::CA2(const char* str)
{
    strncpy(month,str,20);
    cout << "Hello.. " << month << "\n";
}
CA2::CA2(const CA2 &ca)
{
    strncpy(month,ca.month,20);
    cout << "Hi.." << month << "\n";
}
CA2::~CA2()
{
   cout << "Bye.. " << month << "\n";
}
int & func(int &);
int date =1;
CA2 ca1("ca1");
void main()
{
    static CA2 ca2("ca2");
    CA2 *ca_ptr = new CA2("ca_ptr");
    CA2 ca3(ca2);
    cout << "date = " << date << endl;
    date += func(date);
    cout << "date = " << date << endl;
    date += func(date);
    cout << "date = " << date << endl;
}
int & func(int &val)
{
   CA2 ca4("ca4");
   static CA2 ca5("ca5");
   static int count=val;
   int tmp = val;
   val += count + tmp;
   return val;
}
```

4. (10%)

(a). What is the output of the following code?

(b). Suppose we want to use "pointer" instead of "reference types" to achieve same effect. Please rewrite statement 1, 2 and 3 (you will need to use address-of(&) and dereference (*) operators).

```
#include <iostream.h>
test1(int &,int &);    // Statement 1
test2(int,int)
int main()
{
        int a,b;
        a=3;b=4;
        test1(a,b); // Statement 2
        cout<<"a="<<a<<";b="<<b;
        test2(a,b);
        cout<<"a ="<<a<<";b ="<<b;
        return 0;
}
void test1(int& x,int& y) // Statement 3
{
        int temp;
        x=y;
        temp=x;
        y=temp;
}
void test2(int x,int y)
{
        int temp;
        x=y;
        temp=x;
        y=temp;
}
```

5. (10%)What is the output of the following ?

```
#include <iostream.h>
class Integer
{
        static int numb;
        int *pv, *pm;
        public:
              Integer()
                 {
                   pv =new int;
                   pm= new int[4];
                   cout<<"Constructing\n";
                   *pv=numb++;
                   pm[0]=pm[1]=numb++;
                   pm[2]=pm[3]=numb++;
                 }
~Integer()
   {
     cout<<"value= "<<(*pv)<<'\n';
     delete pv;
     cout<<"num= "<<(pm[0]+pm[1]+pm[2]+pm[3])<< '\n';
   }
```

```
};
int Integer::numb=8;
int main()
{
    Integer *py=new Integer [2];
    delete [] py;
    cout<< "--------"<<endl;
    py=new Integer [2];
    delete [] py;
        return (0);
}
```

6. (10%) What is the output of the following ?

```
#include <iostream.h>
#include <string.h>
class STUDENT
      { char name[12];
        double cobol;
            double java;
       public:
            STUDENT(char na[], double co, double ja)
                  { strcpy( name, na );
                    cobol = co;    java = ja;
                  }
            friend STUDENT operator+( STUDENT x, STUDENT y );
            void disp()
                  { cout << "\n" << name
                         << "\n----------------"
                         << "\nCOBOL: "        << cobol
                         << "\nJAVA: "         << java;
                  }
 };
STUDENT operator+( STUDENT x, STUDENT y )
   { STUDENT working_object("TOT-SCORE", x.cobol + y.cobol,
                                          x.java + y.java);
      return working_object;
   }
int main()
      {    STUDENT john( "John", 80.0, 92.5),
             jamis( "Jamis", 78.5, 88.5);
           (john + jamis).disp();
           return(0); }
```

7. (10%)What is the output of the following ?

```
#include <iostream.h>
class CLOCK;
class WATCH
      { int hour, minute, second;
      public:
         WATCH() {hour=1;minute=1;second=1;}
         WATCH( int m, int h, int sec )
               { hour=h; minute=m; second=sec; }
         friend void timing( WATCH *pw, CLOCK *pc );
      };
class CLOCK
```

```
{ int hour, minute;
public:
   CLOCK() {}
  ,CLOCK( int m  int h   { hour=h; minute=m; }
   friend void timing( WATCH *pw, CLOCK *pc );
   friend void print( CLOCK *pc );
};
void timing( WATCH *pw, CLOCK *pc )
  { pc->hour = pw->hour;
    pc->minute = pw->minute;
  }
void print( CLOCK *pc )
  { cout << "The CLOCK time is "
         << pc->hour    << ":"
         << pc->minute << '\n';
  }
int main()
  { CLOCK c( 10, 12 );
    WATCH w( 11, 30, 20 );
    timing( &w, &c );
    print(&c);
    WATCH *pw=new WATCH();
    timing(pw,&c);
    print(&c);
    return(0);
  }
```

8. (10%)What is the output of the following ?

```
#include <iostream.h>
class TestClass
{
public:
 void Write();
 TestClass(){me=1,privateData=0;cout<<"begining"<<endl;}
 TestClass(/*in*/ int initValue);
 ~TestClass();
private:
 int privateData;
 int me;
};

 void TestClass::Write() {cout<<".Private data is"<<privateData<<endl;}
 TestClass::TestClass(/*in*/ int initValue)
 {
 me=2;
 privateData=initValue;
 cout<<"Constructor executing"<<privateData<<endl;
 }
 TestClass::~TestClass()
 {
 cout<<"me="<<me<<"Destructor executing"<<privateData<<endl;
 }
 int main()
 {
  int count;
  TestClass z(4);
```

```
for (count=1;count<=3;count++)
{
        TestClass *TCP=new TestClass(count);
        TCP->Write();
        z.Write();
        delete TCP;
}
return 0;
}
```

9. (20%) What do the following programs do? Please also output the programs.

(a)
```
#include<iostream.h>
void mystery1(int [], int);
int main()
{
   const int arraysize = 10;
   int a[arraysize] = {32, 27, 64, 18, 95, 14, 90, 70, 60, 37};
 mystery1(a, arraysize);
   cout << endl;
   return 0;
}

void mystery1 (int b[], int size)
    {
      if (size > 0)
        {
          mystery1(&b[1], size-1);
          cout << b[0] << " ";
        }
    }
```

(b)
```
#include <iostream.h>
int mystery2 (int *, int);
int (*pf) (int *, int) = mystery2;
const iaSize = 5;
int ia[iaSize] = {7, 4, 9, 2, 5};
int main()
{
   cout << (*pf)(ia, iaSize) << endl;
      return 0;
}

int mystery2(int *ia, int sz)
{
    int val = ia[0];
    for (int i=1; i<sz; ++i)
       if (val > ia[i]) val = ia[i];
    return val;
}
```