National University of Computer and Emerging Sciences

School of Computing **Spring 2018** **Islamabad Campus**

CS103
Computer Programming

Tuesday, April 3, 2018

Serial No:

Mid-II

Total Time: 1 Hour

Total Marks: 75

Course Instructor(s)

Sibt ul Hussain, Hassan Mustafa and Rafia Rahim

_____

Signature of Invigilator

Student Name	Roll No	Section	Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have (**13**) different printed pages including this title page. There are total of (**3**) questions.
5. Use of calculator is strictly prohibited.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
7. Use **proper indentation** while writing code and make sure that your code is legible. Failing to do so can cost you marks.
8. **Please allocate your time properly according to the marks distribution.**
9. Write proper explanation of the error (or bug) where required, without proper explanation no marks will be awarded.

	I	II	III	**Total**
Total Marks	35	20	20	75
Marks Obtained				

Vetted By: _____ Vetter Signature: _____

Question I . . . . . (35 Marks)

Please write proper explanation of the bug or error where required, without proper explanation no marks will be awarded.

(1) **(5 Marks)** What would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

```
#include <iostream>
using namespace std;
class Mystery {
private:
        int *n;
public:
        Mystery() : n(new int) {
        *n=5;
        }
        Mystery( int nn )
        :n(new int)
        {
                *n=nn;
        }
        void operator=(const Mystery & n)
        {
                this->n= new int;
                *this->n=*n.n;
        }
        void display() { cout << *n<<" "; }
        void increase() { *n += 1; }
};
int main(){
        Mystery  b(1), c=b;
        b.increase();

        Mystery a(c);

        a.increase();
        a.display();
        b.display();
        c.display();
}
```

(2) **(5 Marks)** What would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

```
#include<iostream>
using namespace std;
class A {
        int len;
```

```
5           int *ptr;
6   public:
7           A() {
8                   len = 0;
9                   ptr = NULL;
10          }
11          A(int l, int *arr) {
12                  initialize(l);
13                  for (int i = 0; i < l; i++)
14                          ptr[i] = arr[i];
15          }
16          void initialize(int l) {
17                  ptr = new int[l];
18                  for (int i = 0; i < l; i++)
19                          ptr[i] = 0;
20          }
21          void operator=(const A &a) {
22                  len = a.len;
23                  for (int i = 0; i < len; i++)
24                          ptr[i] = a.ptr[i];
25          }
26          A operator+(const A a) {
27                  A temp;
28                  temp.initialize(len);
29                  for (int i = 0; i < len; i++)
30                          temp.ptr[i] = ptr[i] + a.ptr[i];
31                  return temp;
32          }
33          int& operator()(int i) const {
34                  if (i < len)
35                          return ptr[i];
36          }
37          int GetLen() const {
38                  return len;
39          }
40
41          ~A() {
42                  if (ptr != NULL)
43                          delete[] ptr;
44          }
45  };
46
47  void operator <<(ostream &o, const A &a) {
48          for (int i = 0; i < a.GetLen(); i++)
49                  o << a(i) << " ";
50          cout << endl;
51  }
52
53  int main() {
54          int arr1[] = { 1, 2, 3, 4, 5 };
55          int arr2[] = { 5, 4, 3, 2, 1 };
56          A v1(5, arr1), v2(5, arr2), v3;
57          cout << v1;
```

```
58          cout << (v1 + v2);
59          v3 = v2;
60          cout << v3;
61  }
```

(3) **(5 Marks)** What would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

```
1   #include<iostream>
2   using namespace std;
3   class Mystery {
4           int * p;
5   public:
6           Mystery(int value = 0) {
7                   p = new int;
8                   *p = value;
9           }
10          int getP() {
11                  return *p;
12          }
13          bool setP(int x) {
14                  *p = x;
15          }
16          Mystery & operator=(Mystery t) {
17                  p = new int;
18                  *p = *t.p;
19                  return *this;
20          }
21          Mystery add(const Mystery &toAdd) {
22                  Mystery Res;
23                  Res=toAdd;
24                  *Res.p += *p + *toAdd.p;
25                  return Res;
26          }
27          ~Mystery() {
28                  delete p;
29          }
30  };
31  int main() {
32          Mystery o1(3);
33          Mystery o2(6);
34          Mystery o3;
```

```
35          o3=o1.add(o2);
36          cout <<o2.getP();
37          cout <<" " <<o3.getP();
38          return 0;
39  }
```

(4) **(5 Marks)** What would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

```
1   #include<iostream>
2   using namespace std;
3   class ShoppingCart {
4   private:
5           static int itemsCount;
6           string itemName;
7   public:
8           ShoppingCart(string n="1") :
9                           itemName(n) {
10          cout << " Item= " << itemName << " "<<++itemsCount<<endl;
11          }
12          void setItemsCount(int count) {
13                  this->itemsCount = count;
14          }
15          static int getItemsCount() {
16                  return itemsCount;
17          }
18          ~ShoppingCart()
19          {
20                  itemsCount--;
21          }
22  };
23  int ShoppingCart::itemsCount=0;
24  int main() {
25          ShoppingCart Sc_one;
26          ShoppingCart Sc_two("2");
27          Sc_one.setItemsCount(5);
28           {
29                                  ShoppingCart sc_Three("3");
30                                  ShoppingCart *scfour;
31                                  scfour=&sc_Three;
```

```
32          }
33          Sc_two.setItemsCount(10);
34          cout << ShoppingCart::getItemsCount();
35          return 0;
36  }
```

(5) **(5 Marks)** What would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

```
1   #include<iostream>
2   using namespace std;
3
4   class Point {
5           int x, y;
6   public:
7           Point(int a = 0, int b = 0) {
8                   x = a;
9                   y = b;
10                  print();
11          }
12          void print() {
13                  cout << " (" << x << "," << y << ") " << endl;
14          }
15          ~Point() {
16                  cout << "Point is going" << endl;
17          }
18  };
19  class Circle {
20          Point center;
21          float radius;
22  public:
23          Circle() :
24                          center(0, 0) {
25                  radius = 0;
26                  cout << "The basic circle" << endl;
27          }
28          Circle(Point p) :
29                          center(p) {
30          }
31          Circle(const Circle & c) :
32                          center(c.center), radius(c.radius) {
33                  cout << "The copied circle";
34                  center.print();
35          }
36          ~Circle() {
37                  cout << "Circle is going" << endl;
38          }
```

```
};
int main() {
        Point p1;
        Circle c1(p1);
        Circle c3(c1), c4(Circle(c1));
        return 0;
}
```

(6) **(10 Marks)** Identify and correct the errors in the following code so that the main() function could run (You can add new functions if needed). You cannot change the main() function!

```
#include<iostream>
#include<string>
using namespace std;
class Contact{
        string name;
        string phoneno;
        Contact(string n, string r){ name=n;phoneno=r;}
};
class PhoneBook {
        const int ncontacts;
        Contact *s;
        int counter;
        PhoneBook(int nc) {
                ncontacts=nc;
                counter=0;
                s=new Contact[nc];
        }
public:
        PhoneBook(const PhoneBook c) const
        {
                *this=c;
        }
        Contact GetAt(int & i) const
        {
                if(i >=0 && i < ncontacts)
                return s[i];
        }
        void operator+(Contact & C)const
        {
                s[counter++]=C;
        }
};
PhoneBook operator+=(const PhoneBook & c1, const Contact &C) const
{
                c1+C;
}
```

```
37 int main() {
38         PhoneBook c, c2;
39         c+=Contact("ABC","123");
40         c+=Contact("XYZ","456");
41         c2=c;
42         c2+=Contact("LMK","999");
43         PhoneBook c3(c2);
44         return 0;
45 }
```

Question II . . . . . (20 Marks)

Part I

W

hat would be the output produced by executing the following C++ code? **Identify and correct errors, if any**.

Your goal is to write a program for creating a `MovieStore`. Your `MovieStore`should allow for storage of many movies, where each movies should be represented by its name and a unique ID and ratings it has received from users (assume there will be only ten ratings per movie). Your `MovieStore`should also store each user information, where each user can have a name, and unique ID, and the ratings he has given to all movies (assumer ten ratings from a user). In addition, to basic functionality (you have to identify the basic data members and member functions) your MovieStore should allow facility of performing following operations:

```
1 int main(){
2   MovieStore s1, s2; // create two stores
3   s1.AddMovie("Hobbit", 4.5); // add a movie with average rating of 4.5
4   s1.AddUser("Alpha", 3.7); // add a user with average rating of 3.7
5   s1.AddMovieRatings("Hobbit", "Alpha") = 5; // Add the user "Alpha's"
    ↪ rating for movie hobbit  this should add the user ratings to movie
    ↪ "Hobbit" as well as to users record as well
6   s1.AddMovieRatings(2, 3) = 1; // add the rating of 1 for movie id 2 form
    ↪ user-id 3;
7   cout << s1["Hobbit"]; // should print the movie hobbit ratings
8   cout << s1; // should display all the Movie store information
9   }
```

C

Question III . . . . . (20 Marks)

Your goal here is to create a system for building a `BinaryStore` calculator. A `BinaryStore` calculator will store bytes "stored in strings" with their addresses, *i.e.* at each address in the `BinaryStore` there is stored a `Byte`. Each address will be 4 characters string and each byte will be 8 characters strings. Your goal is to identify and write the classes, their data members and functions. Your code must be able to be executed against following sample code. **Please note that you will have to perform operations at bit-level using characters.**

```
int main(){
  // address will be only 4 bit long for this problem
  // bytes will be only 8 bit long
  // create a 10 locations binary store for storing addresses and values
  BinaryStore b1(10);
  b1+="0011"; // add a new address to the store
  b1.Add("0011",Byte("00000010")); // add the byte at newly added address
  b1+="0110";
  b1.Add("0110",Byte("00000110"));
  b1+="1010";
  Byte nb=b1.Get("0011")+b1.Get("0110"); // add two bytes, bit by bit
  b1.Add("1010",nb);

  Byte nb2=b1.Get("1010")+b1.Get("0110");
  bool r=b1.Get("0011")==b1.Get("0110");
  cout<< "Equal = " << r << endl;
  b1.Display();
}
```

x Running this code produces following output

```
Equal = 0
0011 00000010
0110 00000110
1010 00001000
```

(1) **(5 Marks)** Identify all the operators and functions you need to overload and write. Please write down their signatures.

(2) **(15 Marks)** Now write all the classes with the required data members, member functions and operators. Please note that you are only required to write `Add`, `operator+=` and `operator+` functions in the identified classes.