National University of Computer and Emerging Sciences

School of Computing **Spring 2015** **Islamabad Campus**

CS103
Computer Programming

Saturday, March 14, 2015

Course Instructor(s)

Dr. Sibt ul Hussain, Dr. Usman Farrokh and Dr. Fareed Ahmad

Serial No:

Sessional I

Total Time: 1 Hour

Total Marks: 96

_____

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 (**10**) different printed pages including this title page. There are total of (**4**) 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. Write proper explanation of the error (or bug) where required, without proper explanation no marks will be awarded.

	I	II	III	IV	**Total**
Total Marks	51	10	10	25	96
Marks Obtained					

Vetted By: _____ Vetter Signature: _____

Question I . . . . . **(51 Marks)**

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

(a) **(1 Mark)** Define an alias to a pointer to an integer.

(b) **(2 Marks)** Define an variable to store the address of following variable.

```
int *a[4];
      = &a; // write the valid expression to store the address of a
```

(c) **(2 Marks)** Write the code to deallocate following memory

```
char *a[4];
char n[90]=''hello''
a[0]=a[3]=n;
a[1]=new char [40];
a[2]=new char [60];
```

(d) **(3 Marks)** What will be the output of following code. Explain the error or bug if there is any.

```
#include <iostream>
using namespace std;
int main( ){
                const int SIZE = 10000000;
                int i;
                int A[SIZE];

                for(i=0; i<SIZE; i++)
                        A[i] = i;
                int *B;
                B = new int[SIZE];

                for(i=0; i<SIZE; i++)
                        B[i] = A[i];

                for(i=0; i<SIZE; i++)
                        cout << A[i] << " " << B[i] << endl;
                   return 0;
            }
```

(e) **(5 Marks)** What will be the output of following code. Explain the error or bug if there is any.

```
void Initalize(int **p, int nrows, int ncols) {
        p = new int *[nrows];
        for (int i = 0; i < nrows; ++i) {
```

```
                *(p + i) = new int[ncols];
                for (int j = 0; j < ncols; ++j)
                        p[i][j] = 0;
        }
}

void Display(int **p, int nrows, int ncols) {
        for (int i = 0; i < nrows; ++i) {
                for (int j = 0; j < ncols; ++j)
                        cout << p[i][j] << " ";
                cout << endl;
        }
}
int main() {
        int **p;
        Initalize(p, 2, 4);
        Display(p, 2, 4);
}
```

(f) **(5 Marks)** What will be the output of following code. Explain the error or bug if there is any.

```
#include <iostream>
using namespace std;
void F1(int* temp){ *temp = 99; }
void main( ){
        int *p1, *p2;
        p1 = new int;
        *p1 = 50;
        p2 = p1;
        F1(p2);
        cout << *p1 << " " << *p2 << endl;
        p1 = new int;
        *p1 = 88;
        cout << *p1 << " " << *p2 << endl;
        delete p1;
        delete p2;
}
```

(g) **(5 Marks)** What will be the output of following code. Explain the error or bug if there is any.

```
#include <iostream>
using namespace std;
void F1(int*& temp, int &size){
        size=5;
        int a[]={1,2, 3, 4, 5};
        temp=a;
```

```
}
int main( ){
        int *p;
        int s;
        F1(p,s);
        for(int i=0; i  < s; ++i)
                cout<< *(p+i)<< " ";
        cout<<" ;) ";
        return 0;
}
```

(h) **(5 Marks)** What will be the output of following code. Explain the error or bug if there is any.

```
#include <iostream>
using namespace std;
int GetValue(int x) {
        int y = x;
        y = y * y;
        return y*y;
}
int main() {
        const int n = 4;
        int *p[n];
        for (int j = 0; j < 2; ++j) {
                p[2 * j + 1] = new int[2];
                for (int i = 0; i < 2; ++i)
                        p[2 * j + 1][i] = 2 * j + 1;
        }

        *p[0] = GetValue(2);
        *p[2] = GetValue(4);

        for (int j = 0; j < n; ++j) {
                for (int i = 0; i < 1; ++i)
                        cout << p[j][i] << " ";
                cout << endl;
        }
        return 0;
}
```

(i) **(5 Marks)** What would be the output produced by executing the following C++ code segment?

```
#include <iostream>
using namespace std;
void mystery(int s, int e, int m){

```

```
        if (s==e)
        {
                cout <<"["<<s<<"]";
                return;
        }

        cout<<s << " # ";
        mystery(s+1,e,m);
        cout<<" # "<<s*m ;
}
int main( ){
        mystery(2,6,4);
        return 0;
}
```

(j) **(3 Marks)** What will be the output of following code.

```
#include <iostream>
using namespace std;
int main () {
    char *str1 = "Hello ";
    char *str2 = "World!";
    char *ptr = str1;
    char *&rptr = str1;
    rptr = str2;
    cout << ptr << str1 << endl;
}
```

(k) **(5 Marks)** What would be the output produced by executing the following C++ code segment?

```
#include <iostream>
using namespace std;
struct Puzzle
{
        int x, y;
        float z;

                void Init(int x1, int y1)
                {
                        int x=x1;
                        int y=y1;
                        z= x+y;
                }
                void print()
                {
                        cout<< " X= "<< x
                          <<" Y = "<< y
```

```
                                <<" Z = "<< z ;
                }
};

int main() {
        Puzzle p;
        p.Init(5,10);
        p.print();

        return 0;
}
```

(l) **(5 Marks)** What would be the output produced by executing the following C++ code segment?

```
#include <iostream>
#include <cstring>
using namespace std;
// Given the following structure
struct Circle
{
        char label[10];
        int x,y,r;
};
int main()
{
        Circle C;

        strcpy(C.label,"C");
        C.x = C.y = 20;
        C.r = 12;
        Circle* Cptr;
        Cptr = &C;
        char str[] = "Circle";
        strcpy(Cptr->label,"geoge");
        Cptr->x = 20;
        Cptr->x = 30;
        Cptr->r = 4;
        cout<<"\n"<<Cptr->label;
        cout<<"\n"<<C.label;
        cout<<"\n"<<*((Cptr->label)+1);
        cout<<"\n"<<(*Cptr).label;
        return 0;
}
```

(m) **(5 Marks)** What would be the output produced by executing the following C++ code segment?

```cpp
#include <iostream>
#include <cstring>
using namespace std;
// Given the following structure
struct Mystery{

        int *p;
        float y, z;

        void ComputeValue(int y_, int z_)
        {
                y=y_;
                z=z_;
                p[0]=2*y*z;
                p[1]=z*z;
                p[2]=y*y;
        }
        void Initalize(int y_, int z_)
        {
                p=new int [3];
                ComputeValue(y_,z_);
        }
        void Print()
        {
                cout << " Y = "<< y << " Z= "<< z
                << " Y*Y = "<< p[2]<< " Z*Z ="<< p[1] << " 2 * Y * Z = "<< p[0];
        }
        void Delete()
        {
                delete [] p;
        }
};
int main()
{
        Mystery m1, m2;
        m1.Initalize(2,3);
        m2=m1;
        m1.ComputeValue(1,4);
        m2.Print();
        m2.Delete();
        return 0;
}
```

Question II . . . . . (10 Marks)

Write a recursive function that tests for negative integers in an array and returns true or false depending upon the presence of negative number in the array, *i.e.* it should return true if there are no negative numbers in the array otherwise it should return false. Your function can take at most (maximum) two arguments.

Question III . . . . . (10 Marks)

Write a recursive function drawTriangle() to print a triangle of a given height. For instance drawTriangle(6) shall print

```
#
##
###
####
#####
######
```

You are not allowed to use any loop in your program.

Question IV . . . . . (25 Marks)

Write a grading program for a course with the following grading policies:

1. There are two quizzes, each graded on the basis of 10 points.
2. There is two midterm exams and one final exam, each graded on the basis of 100 points.
3. The final exam counts for 50% of the grade, the midterm counts for 25%, and the two quizzes together count for a total of 25%. (Do not forget to normalize the quiz scores. They should be converted to a percent before they are averaged in.)

Any grade of 90 or more is an A, any grade of 80 or more (but less than 90) is a B, any grade of 70 or more (but less than 80) is a C, any grade of 60 or more (but less than 70) is a D, and any grade below 60 is an F. Define and use a structure (or class) for the student record. Identify all the data members and member functions of this structure (or class) and write them. For instance, your class or structure must provide following interface (`public`) functions.

Member Function	**Description**
Initialize	Sets all the member to reasonable values.
Input	Should take the input for different members from user.
Print	Should print the quizes and exames scores as well as the students average numeric score for the entire course and the final letter grade.
GetAverage()	Returns the average marks.
GetGrade()	Returns the Student's grade.