National University of Computer and Emerging Sciences, Lahore Campus

Course:	Computer Programming	Course Code:	CS103
Program:	BS(Computer Science)	Semester:	Fall 2018
Duration:	45 Minutes	Total Marks:	30
Paper Date:	21-Dec-2018	Weight	10
Section:	All	Page(s):	3
Exam:	Final – Part I	Roll No:	
		Section	

Instructions:
- Attempt Part I in the space provided in this sheet.
- Questions during exam are not allowed. Take reasonable assumptions where needed.

Question [10x3 = 30 Marks] For the code segments given below, determine the output/error(s). If there is any error, highlight the exact line that will cause the error.

Part(i)

```cpp
class Date{

private:

    static int day;

    static int month;

    static int year;

public:

    Date(int d=1, int m =1 , int y = 2000){

        day = d; month = m; year = y;

    }

    void Print(){

      cout<<day<<"-"<<month<<"-"<<year<<endl;

    }
};//end of Date class

class Student{

private:


void Print()

{

        cout<<name<<"\t";

        dateOfBirth.Print();

        for(int i=0 ; i<5; i++){

            cout<<marks[i]<<"
";

        }

        cout<<endl;

}

~Student(){

        if(marks != 0)

            delete[] marks;

}
};//end of student class
```

```cpp
    char name[20];

    Date dateOfBirth;

    static int* marks;

public:

    Student(char* n = "", int d=1, int m=1,
int y=2000, int* _marks = 0):dateOfBirth(d,m,y)
{

        strcpy(name, n);

        if(_marks != 0){

            marks = new int[5];

            for(int i=0 ; i<5; i++){

                marks[i] = _marks[i];

            }

        }

        else

            marks = 0;

    }
```

```cpp
int Date::day = 1;

int Date::month = 1;

int Date::year = 2000;

int* Student::marks = 0;

void main()

{

  int size = 5;

  int marks1[5] = {90, 80, 20, 30 ,
60};

  int marks2[5] = {40, 50, 60, 70 ,
80};

  Student s1("Ali", 20,2,1999,
marks1);

  Student s2("Hamza", 5,1,1998,
marks2);

  s1.Print();

  s2.Print();

}
```

Output/Error:

Ali 5-1-1998

40 50 60 70 80

Hamza 5-1-1998

40 50 60 70 80

Error:

1- Line: `delete[] marks; // Static data being deleted multiple times`
2- Line: `marks = new int[5]; // Memory Leakage`

Part(ii)

```cpp
class B{

private:

    int* bptr;
```

```cpp
GC(int gc=40) : D1(gc+10){

        gcPtr = new int(gc);

    }
```

```cpp
public:

    B(int b=10){bptr = new int(b);}

    virtual int GetValue(){

        return *bptr;

    }

    virtual ~B(){

        cout<<"~B()     ";

        if(bptr != 0) delete bptr;

    }

};

class D1 : public B{

private:`

    int* dptr1;

public:

    D1(int d1=20){dptr1 = new int(d1);}

    int GetValue(){

        return (B::GetValue() + *dptr1);

    }

    void Print(){

        cout<<"*dptr1 = "<<*dptr1<<endl;

    }

    ~D1(){

        cout<<"~D1()     ";

        if(dptr1 != 0) delete dptr1;

    }

};

class D2 : public B {

private:

    int* dptr2;
```

```cpp
    int GetValue(){

        return (D1::GetValue() + *gcPtr);

    }

    void Print(){

        cout<<"*gcptr = "<<*gcPtr<<endl;

    }

    ~GC(){

        cout<<"~GC()     ";

        if(gcPtr != 0) delete gcPtr;

    }

};

void main()

{

    B* arr[4];

    arr[0] = new B(1);

    arr[1] = new D1(2);

    arr[2] = new D2(3);

    arr[3] = new GC(4);


    for(int i=0; i<4 ; i++)

    {

        cout<<arr[i]->GetValue()<<" , ";

    }

    cout<<endl;

    for(int i = 0 ; i<4 ; i++)

    {

        delete arr[i];

        cout<<endl;

    }
```

```cpp
public:

    D2(int d2=30){

        dptr2 = new int(d2);

    }

    int GetValue(){

        return (B::GetValue() +
*dptr2);

    }

    ~D2(){

        cout<<"~D2()    ";

        if(dptr2 != 0) delete dptr2;

    }

};

class GC : public D1{

private:

    int* gcPtr;

public:
```

```cpp
        cout<<"------------------------\
n";

        D1* arr2[2];

        arr2[0] = new D1(100);

        arr2[1] = new GC(500);

        for(int i = 0 ; i<2 ; i++)

            arr2[i]->Print();

        for(int i = 0 ; i<2 ; i++)

        {

            delete arr2[i];

            cout<<endl;

        }

}
```

Output/Error:

1, 12, 13, 28

~B()

~D1() ~B()

~D2() ~B()

~GC() ~D1() `B()

----

*dptr1 = 100

*dptr1 = 510

~D1() ~B()

~GC() ~D1() ~B()

Part(iii)

```cpp
void RecFun(int* arr, int start, int end)

{
```

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```cpp
        if(end > start+1)

        {

                int mid = (start+end)/2; //int(4.5) = 4

                cout<<"mid = "<<mid<<"\t arr[mid] = "<<arr[mid]<<endl;

                if(arr[mid]%2 == 0)

                {

                        RecFun(arr, start, mid-1);

                        cout<<"Value = "<<arr[mid]<<endl;

                        return;

                }

                else

                {

                        RecFun(arr, mid+1, end);

                }

                for(int i=start; i<mid; i++)

                        cout<<arr[i]<<",";

                cout<<endl;

        }

}

void main()

{

        int arr1[] = {1,2,6,9,5,7,12,8,9,10};

        RecFun(arr1, 0, 9);

}
```

Output/Error:

Mid = 4   arr[mid] = 5

Mid = 7   arr[mid] = 8

Value = 8

1, 2, 6, 9