

Question 1 Write the output of the following code:

Marks 5

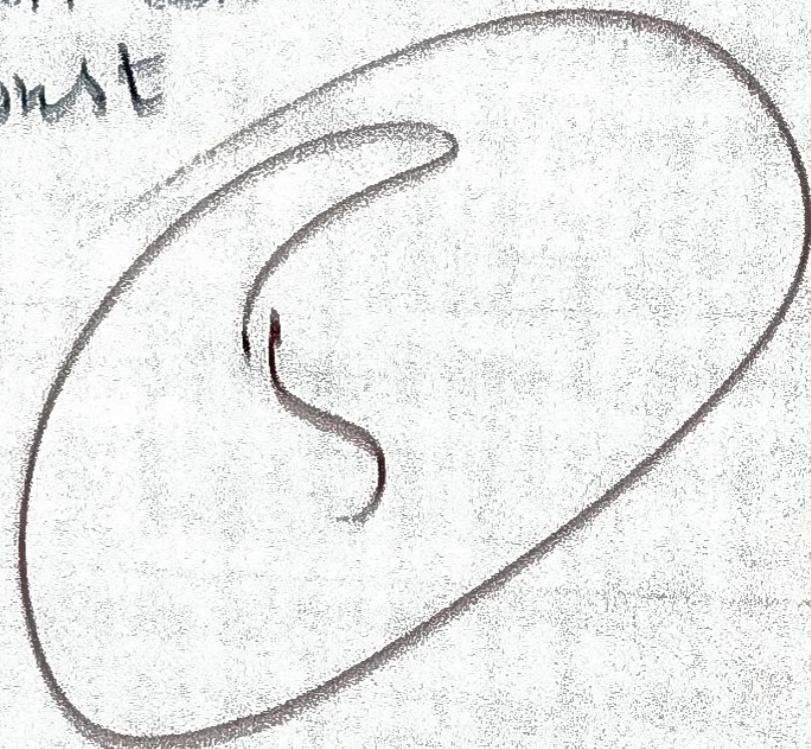
```
#include <iostream>
using namespace std;
class X {
public:
    void print() {
        cout << "non-const\n";
    }
    void print() const {
        cout << "const\n";
    }
};

void callPrint(X& x) {
    x.print();
}

void callPrint(const X& x) {
    x.print();
}

int main() {
    X a;
    const X b;
    callPrint(a);
    callPrint(b);
    a.print();
    b.print();
    return 0;
}
```

non-const  
const  
non-const  
const



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2/25  
Marks

Question 2 Write the output of the following code:

```
#include <iostream>
using namespace std;
class A {
public:
    ~A() { cout << "A's constructor\n" }
    ~A() { cout << "A's destructor\n" }
};

class B : public A {
public:
    ~B() { cout << "B's constructor\n" }
    ~B() { cout << "B's destructor\n" }
};

class C : public B {
public:
    ~C() { cout << "C's constructor\n" }
    ~C() { cout << "C's destructor\n" }
};

int main() {
    C c;
    return 0;
}
```

B's constructor  
A's constructor  
C's constructor  
C's destructor  
A's destructor  
~~C's destructor~~

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Question: 6 Write the output of the following code:

```
class Employee {
public:
    Employee(const string& f, const string& l)
        : firstName(f), lastName(l) {}
    virtual ~Employee() = default;
    virtual float earnings() const = 0;
    virtual void print() const = 0;
protected:
    string firstName;
    string lastName; }
```

```
class PieceWorker : public Employee {
public:
    PieceWorker(const string& f, const string& l, float r,
                unsigned p)
        : Employee(f, l), rate(r > 0 ? r : 0), pieces(p > 0 ? p :
0) {}
    float earnings() {return rate * pieces; }
    void print() const override {
        cout << "Piece Worker: " << firstName << " " <<
lastName; }
private:
    float rate;
    unsigned pieces; }
```

```
int main() {
    Employee* e = new PieceWorker("John", "Doe", 2.5,
100);
    e->print();
    cout << " earned $" << e->earnings();
    return 0;
}
```

Marks 5

Piece Worker:  
earned \$ 250

John Doe

10<sup>0</sup>  
2<sup>0</sup>  
500  
250  
200%  
250%

Question: 4 Write the output of the following code:

```
#include <iostream>
using namespace std;
class Base {
public:
    Base(int v) { cout << "Base(" << v << ")\n"; }
};
class Derived : public Base {
public:
    Derived() { cout << "Derived()\n"; }
};
int main() {
    Derived d;
    return 0;
}
```

error : base class  
needs a parameter  
in constructor.

Q3

Marks 5

Question: 5 Write the output of the following code:

```
#include <iostream>
using namespace std;
class Example {
    const int limit;
    int count;
public:
    Example(int limit) : limit(limit) {
    }

    void increment() const {
        if (count < limit)
            ++count;
    }

    int getCount() {
        return count;
    }
};

int main() {
    const Example ex(3);
    ex.increment();
    cout << ex.getCount() << endl;
    return 0;
}
```

error:  
in line 21 trying to  
change a const object

Q5

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Question: 3 Write the output of the following code:

Marks 5

```

#include <iostream>
using namespace std;
class Base {
public:
    Base(const char* msg = "hello") {
        cout << "Base: " << msg << endl;
    }
    ~Base() {
        cout << "Base destructor" << endl;
    }
};

class Derived : public Base {
public:
    Derived() {
        cout << "Derived default" << endl;
    }
    Derived(const char* m) : Base(m) {
        cout << "Derived: " << m << endl;
    }
    ~Derived() {
        cout << "Derived destructor" << endl;
    }
};

int main() {
    Derived d1;
    Derived d2("world");
    return 0;
}

```

Base: hello

Derived default

Base: world

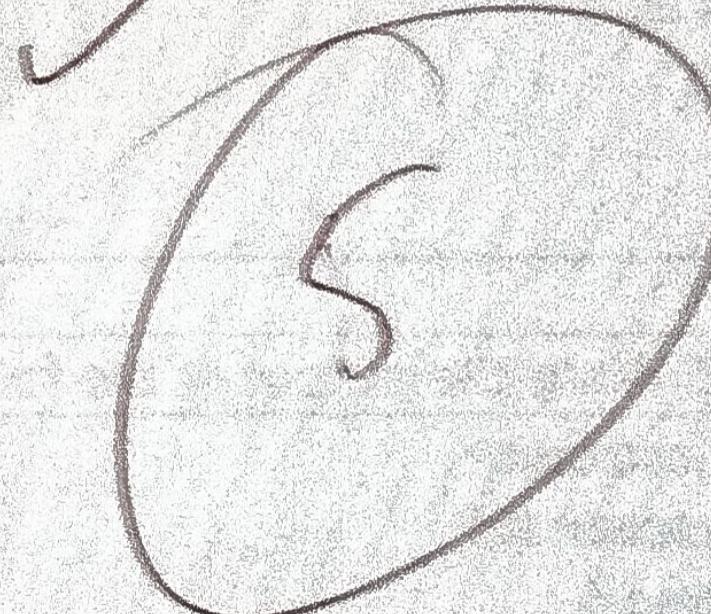
Derived: world

Derived destructor

Base destructor

Derived destructor

Base destructor



Question: 8 Write the output of the following code:

```

class Memory {
    float capacity;
public:
    Memory(int cap = 1) {
        capacity = cap;
        cout << " Added Memory of Capacity=" << capacity << " G " << endl;
    ~Memory() { cout << " Removed Memory of Capacity=" << capacity << " G " << endl; };
}

class Core {
    float speed;
public:
    Core(float speed_ = 3.3) {
        speed = speed_;
        cout << " Added 1 Core of Speed=" << speed << " GHz " << endl;
    ~Core() { cout << " Removed 1 Core of Speed=" << speed << " GHz " << endl; };
}

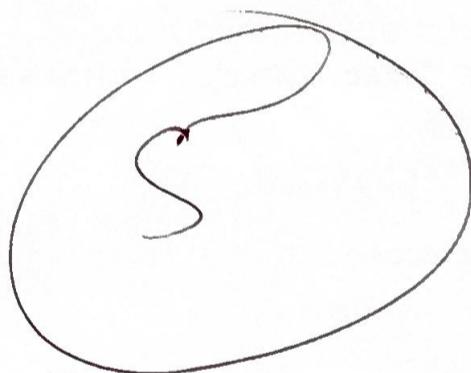
class Processor {
    const int ncores;
    Core cores[4];
public:
    Processor() : ncores(4) {
        cout << " Added a Processor of " << ncores << " Cores " << endl;
    ~Processor() { cout << " Removed a Processor of " << ncores << " cores " << endl; };
}

class Mobile {
    Memory m;
    Processor p;
public:
    Mobile() { cout << " Building a Mobile " << endl; }
    ~Mobile() { cout << " Destroying a Mobile " << endl; };

int main() {
    Mobile m;
    cout << " :) The End " << endl;
}

```

Added Memory of Capacity = 1G  
 Added 1 Core of speed = 3.3GHz  
 Added a Processor of 4 Cores  
**Building a Mobile**  
 :) The End  
**Destroying a Mobile**  
 Removed a Processor of 4 cores  
 Removed 1 core of speed = 3.3GHz  
 Removed Memory of Capacity = 1G



Question: 12 Write the output of the following code:

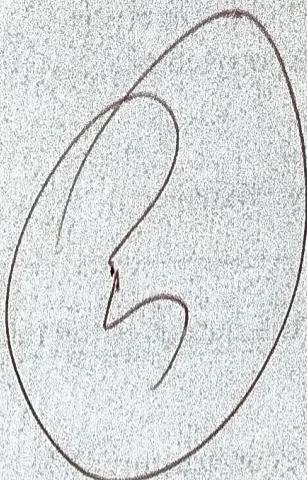
```
class Device {
public:
    virtual void activate() { cout << "Generic
Device\n"; }
    virtual ~Device() {}};

class SmartThermostat : public Device {
public:
    void activate() { cout << "Smart Thermostat\n";
};

class HomeController {
private:
    Device* device;
public:
    HomeController(Device* d) : device(d) { cout <<
"HomeController\n"; }
    void operate() { device->activate(); }
    ~HomeController() { delete device; };

int main() {
    HomeController hc(new SmartThermostat());
    hc.operate();}
```

Home Controller  
Smart Thermostat



Marks 5

Question: 13 Write the output of the following code:

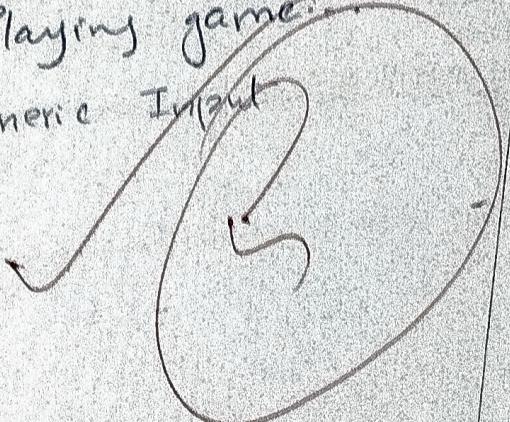
```
class Controller {
public:
    Controller() { cout << "Controller created\n"; }
    virtual void input() { cout << "Generic Input\n"; }
    virtual ~Controller() { cout << "Controller
destroyed\n"; };

class Game {
private:
    Controller& controller;
public:
    Game(Controller& c) : controller(c) {
        cout << "Game created\n"; }
    void play() {
        cout << "Playing game...\n";
        controller.input(); }

Game* createGame() {
    Controller tempController;
    Game* g = new Game(tempController);
    return g; }

int main() {
    Game* g = createGame();
    g->play();
    delete g; }
```

Controller created  
Game created  
Controller destroyed  
Playing game.  
Generic Input

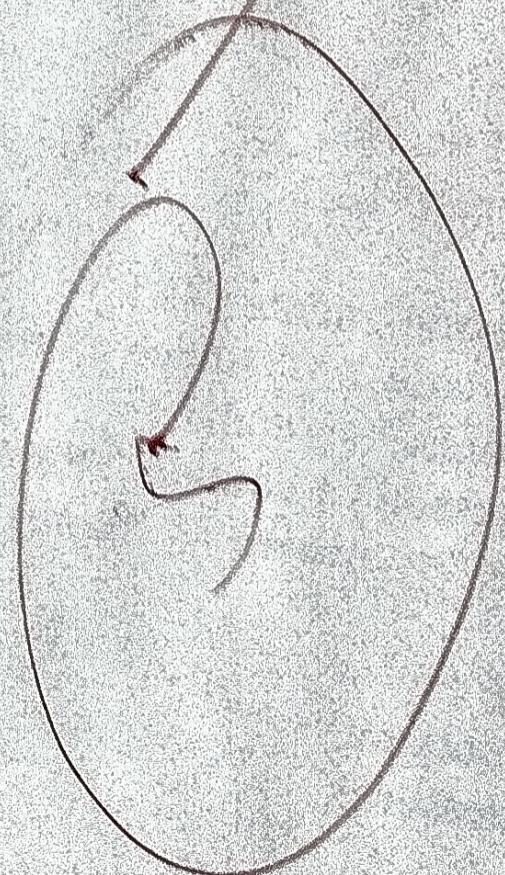


Page 10 of 32

Question: 9 Write the output of the following code:

```
class Employee {  
public:  
    Employee(const string& f, const string& l);  
    firstName(f), lastName(l) {}  
    virtual ~Employee() {  
        cout << "Base Employee destructor called" <<  
        endl;}  
    virtual float earnings() const = 0;  
    virtual void print() const = 0;  
protected:  
    string firstName;  
    string lastName;};  
  
class PieceWorker : public Employee {  
public:  
    PieceWorker(const string& f, const string& l, float  
r, unsigned p)  
        : Employee(f, l), rate(r), pieces(p) {}  
    ~PieceWorker() override {  
        cout << "Derived PieceWorker destructor  
called" << endl;}  
    float earnings() const override {  
        return rate * pieces; }  
    void print() const override {  
        cout << "Piece Worker: " << firstName << "  
<< lastName;}  
private:  
    float rate;  
    unsigned pieces;};  
  
int main() {  
    Employee* e = new PieceWorker("John", "Doe",  
2.5, 100);  
    e->print();  
    cout << "earned $" << e->earnings() << endl;  
    delete e;}
```

PieceWorker John Doe  
Derived PieceWorker  
called.  
Base Employee destructor  
called



Question: 10 Write the output of the following code:

```
class Employee {
public:
    virtual void print() const = 0;
};

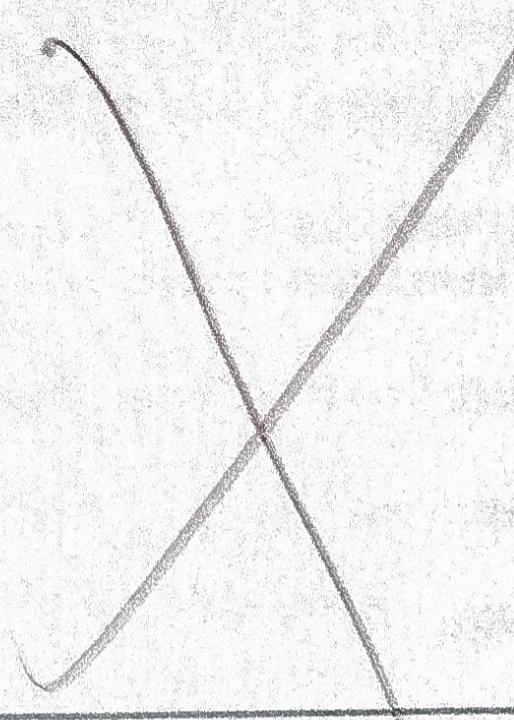
class Manager : public Employee {
public:
    void print() const override {
        cout << "I'm a Manager\n";
    }

    virtual void approveLeave() const = 0;
};

class HRManager : public Manager {
public:
    void approveLeave() const override {
        cout << "Leave Approved\n";
    }
};

int main() {
    Employee* e = new Manager();
    e->print();
}
```

I'm a Manager



Question: 11 Write the output of the following code:

Marks 5

```
class A {
public:
    A() { cout << "A constructor\n"; }
    void sayHello() { cout << "Hello from A\n"; }

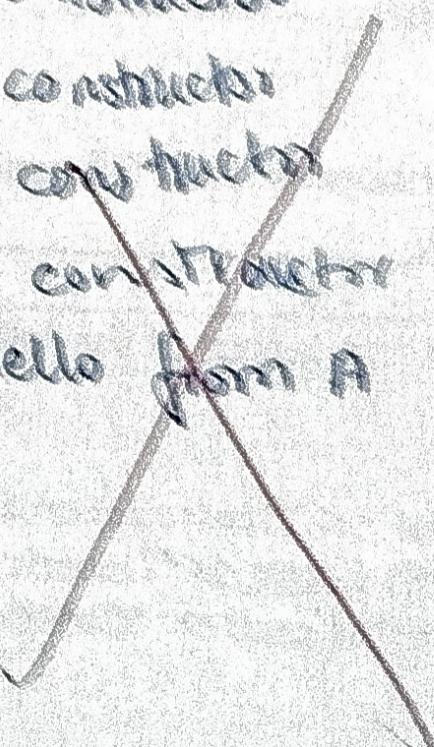
class B : virtual public A {
public:
    B() { cout << "B constructor\n"; }

class C : public A {
public:
    C() { cout << "C constructor\n"; }

class D : public B, public C {
public:
    D() { cout << "D constructor\n"; }

int main() {
    D d;
    d.sayHello();
}
```

- A constructor
  - C constructor
  - B constructor
  - D constructor
- Hello from A



Question: 14 Write the output of the following code:

Marks 5

```
class Asaan {
public:
    Asaan() {
        cout << "Ye sab se asaan paper hai"
        << endl;
    }
    ~Asaan() {
        cout << "Sab ko is mein full marks
        milne chahiye" << endl;
    }
};

class AurAsaan : public Asaan{
public:
    AurAsaan() {
        cout << "Ye class Asaan se aayi hai" <<
        endl;
    }
    ~AurAsaan() {
        cout << "Is liye ye aur bhi asaan
        hojata hai" << endl;
    }
};

class ZiyadahAsaan{
public:
    AurAsaan paper;
    ZiyadahAsaan() {
        cout << "Ye aakhri message hai" <<
        endl;
    }
    ~ZiyadahAsaan() {
        cout << "Allah se dua hai ke har kisi ko
        is mein kamyabi mile." << endl;
    }
};

int main()
{
    ZiyadahAsaan paper;
    return 0;
}
```

- Ye sab se asaan paper hai  
- Ye class Asaan se aayi hai  
- Ye Aakhri message hai  
- Allah se dua hai ke har
 kisi (is) is mein full
 marks milne  
: Is liye yeh or bhi
 asaan ho jata hai  
Sabko is mein full
 marks milne chahiye



**Question: 15 Answer the questions**

How much memory a pointer to character variable takes? 2 Marks

~~Memory of a pointer  
on the system architecture  
(64 bit or 32-bit)~~

What is the output of the following program segment? Identify errors (if any). 1 Mark

```
char* p1 = "Hello World";
int * p2;
cout << sizeof(p1)-sizeof(p2);
```

~~19. error  
BECOS p2 is a wild  
and both p1 & p2  
have same size; on  
same architecture.~~

What is the output of the following program segment? Identify errors (if any). 1 Marks

```
char* p1 = "Hello World";
cout << &p1[5]-p1;
```

5

What is the output of the following program segment? Identify errors (if any). 2 Marks

```
int arr[] = {5, 9, 12, 14, 72};
int *p2 = arr;
for(int i=0; i<5; i++){
    p2++;
    cout << *p2+i << " ";
}
```

~~9 13 16 75 garbage  
Error~~

~~Going out of bound  
in last iteration~~

Write a recursive function in c++ which takes an integer array and two integer variables (start index and last index) of array as arguments and reverse the elements of that array.

You are not allowed to use static, global variables, loops and default arguments. 4 Marks

if an arr is {1,2,3,4,5,6}  
reverseArray(arr,0,5) will make the array as  
{6,5,4,3,2,1}

```
void reverseArray(int a[], int s, int e){
    //write body of this function in right box
}
```

```
void reverseArray(int a[], int s, int e){
    if(s > e) { return; }
    int temp = a[s];
    a[s] = a[e];
    a[e] = temp;
    reverseArray(a, s+1, e-1);
}
```

Question: 16

Marks 5

Given four single dimensional arrays of integers of same size. How can we use all of them by one name? Also use that for taking input from the user. You can allocate single variable from stack memory

and minimum required memory from heap. Don't copy the values. Use same arrays.

Hint: In your code we should use single nested loop to take input in all four arrays.

```
int a[5];  
int b[5];  
int c[5];  
int d[5];
```

//write your code below