

1. What is the output of the following program segment?

```
#include <iostream>
using namespace std;
class BAR{
    int var;
public:
    BAR(int v){
        var=v;
    }

    void display(){ cout<<var; }
    BAR& operator+(BAR a){
        this->var+=a.var;
        return *(this);
    }
};

int main() {
    BAR f1(5), f2(12), f3(14);
    f3=f1+f2;
    f3.display();
    cout<<" ";
    f1.display();
    return 0;
}
```

- a. 17 5
- b. 17 12
- c. 17 14
- d. 17 17
- e. None of the above

2. A copy constructor has one compulsory argument, an object passed by reference:

- a. True
- b. False

3. Let Distance be a class in C++ and d1 is an object already declared; which of following is being called in statement:

```
Distance d2 = d1;
```

- a. Assignment operator
- b. Copy Constructor
- c. Default Constructor
- d. All of the above
- e. None of the above

4. Assume that InventoryItem is the name of a class, and the class has a void member function named setPrice which accepts a double argument. If book is an instance of the InventoryItem class, which of the following statements properly uses the book object to call the setPrice member function?

- a. InventoryItem::setPrice(1.49)
- b. book.setPrice(1.49)
- c. book::setPrice(1.49)
- d. book:setPrice(1.49)

5. Aggregation of classes can be done by
 - a. ✓ Pointer and alias / reference
 - b. Object and pointer
 - c. Object and reference
 - d. All of above
 - e. None of the above
6. In C++, what are cin and cout?
 - a. ✓ Streams
 - b. Files
 - c. Functions
 - d. Objects
 - e. None of the above
7. Which of the following is true:
 - a. Constructors and destructors are both inherited in all derived classes
 - b. Only destructors are inherited in derived classes (that is why we make them virtual)
 - c. ✗ A class can have multiple destructors but only the virtual one is inherited in derived classes
 - d. All of above
 - e. None of the above
8. The public functions that are designed to provide read operations for the private members in the class are called:
 - a. ✓ Accessors
 - b. Mutators
 - c. Both a) and b)
 - d. All of above
 - e. None of the above
9. The public functions that are designed to provide write operations for the private members in the class are called:
 - a. Setters
 - b. ✓ Mutators
 - c. Both a) and b)
 - d. All of above
 - e. None of the above
10. You must declare all private members of a class before public members
 - a. True
 - b. ✓ False

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Question 2 [3 + 3 + 3 + 3 + 3 = 15]

1. Write an output of the program try to remove errors incase it exist (3 Marks).

```
#include <iostream>
using namespace std;
class Item {
private:
    int i;
public:
    Maze(int i) {
        this.i = i;
        cout << "C" << i << endl;
    }
    ~Maze() {
        cout << "D" << i << endl;
    }
};
```

```
Item a(1);
int build() {
    Item d(4);
    static Item e(5);
}
int main() {
    Item b(2);
    static c(3);
    build();
    Item f(6);
    return 0;
}
```

Output:

2. Modify the code given below such that the following statement o.setX(10).setY(20) can be executed without logical and syntax error (3 Marks):

```
#include<iostream>
using namespace std;
class Horizon {
public:
    void setX(int _x) {
        x = -_x;
    }
    void setY(int _y) {
        y = -_y;
    }
private:
    int x;
    int y;
};
int main() {
    Horizon o;
    o.setX(10).setY(20);
    return 0;
}
```

Write your code below

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3. Write an output of the following code also correct error if exists (3 Marks).

```
class Mystery {  
public:  
    static int n;  
    Mystery() {cout << n++ << endl;}  
    Mystery(int i) {n=i; cout << n << endl;}  
    static void somefunc() {n=5;}  
    Mystery(Mystery const& otherNum) {n+=5;  
        cout << n << endl;}  
    ~Mystery() {cout << --n << " ";}  
};  
  
void fun(Mystery n) { cout << n.n << endl;  
n.somefunc();}  
  
int main(){  
    Mystery b(9), c;  
    ↳ fun(b);  
    return 0;  
}
```

Output:

4. Write an output of the following code also correct errors if it exists (3 Marks)?

```
#include <iostream>  
using namespace std;  
class Number {  
private:  
    int n;  
public:  
    Number() : n(0) {  
        cout << n;  
    }  
    Number( int nn )  
    : n(nn)  
    {  
        cout << n;  
    }  
    Number(Number const& otherNum)  
    : n(otherNum.n+1)  
    {  
        cout << n;  
    }  
    void display() { cout << n; }  
    void increase() { n += 1; }  
};  
int main(){  
    Number a, b(1), c(b);  
    b.increase();  
    c.display();  
    b.display();  
}
```

Output:

5. Write an output of the following code also correct errors if it exists? (3 Marks)

```
#include <iostream>
using namespace std;
class Point {
private:
    double x;
    double y;
public:
    Point(int x_=0, int y_=0) { x = x_; y = y_; }

    void setX(double newX) { x = newX; }
    void setY(double newY) { y = newY; }

    double getX() const { return x; }
    double getY() const { return y; }
    ostream & operator<< (ostream & out)
    {
        out << x << " " << y;
        return out;
    }
    Point operator+(const int & x)
    {
        return Point(50, 100);
    }
};

Point operator+(const int & x, const Point &p)
{
    return Point(p.getX() + x, p.getY() + x);
}

int main()
{
    Point p(4,5), p2;
    p2 = 5 + p; // Error P2 = p + 5;
    p << cout << endl;
    p2 << cout << endl;
}
```

Output:

$P \rightarrow (4,5)$
Pc 50, 100.

Question 3 [15 Marks]

You are aware of the two system for measuring weights metric (International System or SI or cgs) units and Imperial US system.

Kilogram (kg, kilos)	The prefix "kilo" means 1,000, so there are 1,000 grams in a kilogram. One kg = 2.205 pounds.
Pound (lb, lbs)	A pound is an English unit of weight. There are 453.592 grams in a pound. 1 pound (lb) is equal to 16 ounces (oz):

The astronauts working at international space station come from different countries. The weight of their belongings is described in different systems, i.e. weight of some object is described in metric system and weight of some objects is described in US imperial system. Your task is to provide functions to facilitate the process of calculating sum and compare the weight of two objects using the concept of operator overloading. You should be careful while deciding whether the selected operator should be overloaded as member function or not.

Consider the following classes to manipulate the weight of the given objects.

```
class imp_Weight{
    long pounds;
    short ounces;
};

class met_Weight{
    long kg;
    short gm;
};
```

You have to overload the following operators

Operator	Description
+	Calculate sum of the weight of the two objects in the metric system .
>	Check whether the weight of first object is more than the weight of second object in the metric system .
<	Check whether the weight of first object is less than the weight of second object in the metric system . You are not allowed to use < (less than) operator in the function definition.
==	Check whether the weight of two objects is equal or not. Weight of one object is described in metric system and the weight of second object is described in US imperial system. Implement the operator in the metric system class only.
++	Increase the weight of the object by one unit in the metric system .

Question 4 [10 Marks]

Read through each code snippet below and answer the questions that follow.

S.No	Code
1	<pre>class Document { //some members and functions }; Document* createNewDocument() { Document *newDoc = new Document; return newDoc; } class Workbook { private: int ID; static int num_books; Document *doc; public: Workbook(int id) {this->ID = id;} void init() { doc = createNewDocument(); num_books++; } }; int main() { Workbook w(0); w.init(); return 0; }</pre> <p>(a) Is there a compilation error in the above code? If yes, find and correct it. [2 marks]</p> <p>(b) What is the relationship between the Document and Workbook class. Give a reason for your answer. [2 marks]</p> <p>(c) Identify and correct a memory leak in this code. [1 mark]</p>
2	<pre>class Ticket{ private: int ticketID; char* text; //pointer to array of length 50 public: Ticket(int ID) {ticketID = ID; text = new char[50];} void inputText() {cin>>this->text;} void display() {cout<<"ID: "<<ticketID<<, Text: "<<text<<"\n";} }; int main() { Ticket *t1 = new Ticket(1);</pre>

```
t1->inputText();  
Ticket t2(*t1);  
t2.display();  
delete t1;  
t2.display();  
}
```

(a) Write the copy constructor for the Ticket class. [3 marks]

(b) Assuming the user input is “Browser”, what will be the output? [2 marks]