Object Oriented Programming Practice Exam

**Duration: 1 hr 15 min**

**Total Marks: 60**

# Part 1: Multiple Choice Questions (10 marks)

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| **S #** | **Question** |
| 1 | int list[5] = {1,2,3,4,5};  std::cout<<\*list;  What will be the output of the above C++ code?   1. It will print the address of the list array in memory 2. It will output the first element of the list array, i.e. 1 3. It will print all the elements of the list array 4. None of the above. |
| 2 | class Student  {  private:  int ID;  std::string name;  public:  void display() {}  };  Student S1;  Given the above C++ code, which of the following statements would give an error:   1. cout<<S1.ID; 2. S1.display(); 3. Student \*ptr = new Student; 4. None of the above. |
| 3 | struct Book  {  int ID;  int pages;  int price;  };  Book B\_Array[3] = {{5,600,7000},{6,40},{}};  Given the above C++ code, what are the values of B\_Array[1]?   1. ID: 0; pages: 6; price: 40 2. ID: 6; pages: 40; price: 0 3. ID: 6; pages: 40; price: uninitialized/garbage value 4. None of the above |
| 4 | int a = 10;  int b = 5;  int \*ptr1 = &a;  int \*ptr2 = &b;  ptr2 = ptr1;  cout<<\*ptr1<<"\t"<<\*ptr2<<"\n";  What will the above C++ code output?   1. 5 5 2. 10 5 3. 5 10 4. None of the above. |
| 5 | class myClass  {  private:  int a;  protected:  int b;  public:  void myFunction();  };  class anotherClass: protected myClass  {  //some data members and functions here  };  Given the above C++ code, which of the following statements is true:   1. myClass::a is inherited as a private member in anotherClass 2. You can call myFunction in main using any object of anotherClass 3. myClass::b is inherited as a protected member in anotherClass 4. None of the above. |
| 6 | int sum(int, int);  double sum(int, int);  Which concept does the above C++ code demonstrate?   1. Function overloading 2. Function overriding 3. Operator overloading 4. None of the above. |
| 7 | class Engine  {  //data members and functions  };  class Car  {  private:  Engine \*e;    public:  Car() { e = new Engine; }  ~Car() { delete e; }  };  Given the above C++ classes, which relationship exists between the Car and the Engine class?   1. Composition 2. Aggregation 3. Association 4. None of the above. |
| 8 | class Student  {  public:  static int count;  int marks;  };  Student s;  Given the above C++ code, which of the following statements would generate an error:   1. s.marks = 60; 2. s.count = 10; 3. Student::count = 10; 4. None of the above |
| 9 | class Base  {  public:  Base() {cout<<"Base Constructor\t";}  };  class Derived: public Base  {  public:  Derived() {cout<<"Derived Constructor\t";}  };  class Derived2: public Derived  {  public:  Derived2() {cout<<"Derived2 Constructor\t";}  };  int main()  {  Derived2 d2;  return 0;  }  What is the output of the above C++ program?   1. Derived Constructor Derived2 Constructor 2. Derived2 Constructor 3. Derived2 Constructor Derived Constructor Base Constructor 4. None of the above. |
| 10 | class A  {  public:  void print();  };  class B: public A  {  public:  void display();  };  class C: public A  {  public:  void display();  };  class D: public B, public C  {  public:  void print();  };  D objectD;  In C++, given the above code (assume functions are defined elsewhere), which of the following statements will fail to execute:   1. objectD.print(); 2. objectD.C::display(); 3. objectD.A::print(); 4. None of the above. |

# Part 2: Short Questions (50 marks)

Write the answers to the following questions in the given space.

Q1. Say you have a class Rectangle. You create the following variables:

Rectangle\* ptr = new Rectangle;

Rectangle\* &ref = ptr;

(a) What kind of variable is **ref**? (1 mark)

(b) If the Rectangle class has a function called **display()**, how would you call **display()** through **ref**? (1 mark)

Q2. List one similarity and two differences between the **private** and **protected** access specifiers in a C++ class. (3 marks)

Q3(a) What are **constant** objects in C++? (1 mark)

Q3(b) Can you make a **constant** object of any class? If not, then what are the requirements for a class from which you wish to instantiate a constant object? (2 marks)

Q4 (a) Write a parameterized constructor for the class Test below that initializes all its data members. (5 marks)

class Part{

private:

int x;

public:

Part(int);

};

class Test{

private:

int a;

const int b;

char &cRef;

Part p;

};

(b)Now show how you will create an object of the class Test in main. (1 mark)

Q5(a) Describe the purpose of static class members. (1 mark)

(b) Show, with a code example, how to declare, initialize and access/update a static class member. (4 marks)

(c) Describe a scenario in which you would need a static function. Can static functions be called through objects of a class? (2 marks)

Q6. Given the following code:

class Employee{

private:

int salary;

public:

Employee(int s) {salary=s;}

int operator+(Employee e1) {return this->salary + e1.salary;}

};

Employee e1(100); Employee e2(200); Employee e3(300);

int total = e1+e2+e3;

(a)State whether this code will work or give an error. (1 mark)

(b) If it works, describe how (i.e. in what steps is the expression e1+e2+e3 evaluated)? If it gives an error, explain why, and also show how would you correct the code to get the total to compute correctly. (3 marks)

Q7. Given the following classes:

class Base{};

class Derived1: public Base { };

class Derived2: public Base { };

class Derived3: public Derived1, public Derived2 { };

(a)If we create an object of class Derived3, what constructors are called and in what order? (3 marks)

(b) What if we inherit Derived1 and Derived2 virtually from Base? What constructors are called now and in what order? (2 marks)

Q8. Give two examples of static/compile-time polymorphism and one example of dynamic/run-time polymorphism. You do not have to write code. (3 marks)

Q9. Given the following code:

class Shape{

public:

virtual void print() = 0;

};

class Rectangle: public Shape{

public:

void draw();

};

class BlueRectangle: public Rectangle{

public:

void print() {cout<<"Hello\n";}

};

Will the following statements execute? If not, give a reason.

Rectangle R1

Shape s

Shape \*s

Rectangle \*r

BlueRectangle br

Rectangle \*r = &br

Shape \*s = &br

(7 marks)

Q10. Name the relationship that exists among the classes in the following scenarios and give a reason for it:

1. Each person has contact details, and multiple people can share the same contact details. What is the relationship between the **Person** and **ContactDetail** classes?
2. Each book in a bookstore belongs to a shelf. One book can only belong to one shelf. If a store removes a shelf, all the books on it will also be removed from the store. What is the relationship between the **Book** and **Shelf** classes?
3. Each student in a university is enrolled in a number of courses. Each course has multiple students enrolled. What is the relationship between the **Student** and **Course** classes?
4. A property owner owns several buildings; each building has offices of several companies in it. Each company only has one office. What is the relationship between the **company** and **building** classes?
5. In the above scenario, if each company had offices in multiple buildings, what would be the relationship between **company** and **building**?

(10 marks)