CS217 Object Oriented Programming

Serial No:

Monday, June 23, 2020

Course Instructor

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Final Term Exam
Spring Semester 2020
Max Time: 3 Hour
Max Marks: 80
Exam Weight (Out of 100). 40

_____ Roll No	_____ Section

Guidelines for Submission:

1. You should submit only one PDF document.
2. Write your Roll No on start of each answer.
3. Write the answers on paper and take picture. The figure/image can be pasted inside that document under the appropriate question.
4. Solution file should be saved as "Rollno_Name".
5. You must submit your solution before due time via Google Classroom. Submissions submitted after the due time shall not be considered.
6. If you don't finish every part of a question, don't worry! You can still submit what you've done to get marks based on your efforts.
7. In case of copied or plagiarized solutions in exam Or If a student provided help to another student during exam both will be awarded **"F"** grade and it will affect the student CGPA.
8. **Viva** of any student can be conducted by the instructor after conducting an online exam **in case of any doubt.**
9. This document should be submitted through LMS Google Classroom. But in worst case, you can email it within the deadline.
10. Students who will upload the answer sheets as directed containing appropriate answers under the question and follow all the above directions will be give **2 marks.**

	Instruction 10	Q1	Q2	Q3	Q4	Q5	Total
Marks	**2**	**6*3=18**	**3*6=18**	**12**	**15**	**15**	**80**
Obtained							

1. Short Questions **[6*3=18]**

I.

Explain why a C++ program would use the statement

```
Array< Employee > workerList( 100 );
```

II.

Suppose that class template Employee has a static data member count. Suppose that three class-template specializations are instantiated from the class template. How many copies of the static data member will exist? Explain.

III.

Why do we need a static member function in a class? Explain its potential use with the help of an example. A concise and brief answer will result in maximum marks.

IV.

As a rule of thumb, one should provide an explicit copy constructor in a class when object copy operation involves dynamic memory. Could you come up with an example where you do not use dynamic memory but still want to implement a copy constructor?

V.

Why must the parameter to the copy constructor be passed by (const) reference?

VI.

Under what condition(s) will the default copy constructor supplied by the compiler lead to memory leaks or runtime errors?

2. Coding Questions [3*6=18]

I.
. Convert the following algorithm into code by using the concept of virtual class:

Step 1: Start the program.
Step 2: Declare the base class student.
Step 3: Declare and define the functions getnumber() and putnumber().
Step 4: Create the derived class test virtually derived from the base class student.
Step 5: Declare and define the function getmarks() and putmarks().
Step 6: Create the derived class sports virtually derived from the base class student.
Step 7: Declare and define the function getscore() and putscore().
Step 8: Create the derived class result derived from the class test and sports.
Step 9: Declare and define the function display() to calculate the total.
Step 10: Create the derived class object obj.
Step 11: Call the function get number(),getmarks(),getscore() and display().

Step 12: Stop the program.

II.

Consider the following given code.

```
1. class Employee {
2. private:
3.    std::string name;
4.    double salary;
5.    double taxRate;

6. public:
7.    Employee() :
8.       salary(0),
9.       name(NULL),
10.     taxRate(0){};

11.      Employee(std::string n, double sal) :
12.         name(n),
13.      taxRate(10),
14.      salary(sal) { }

15.     Employee& Employee (const Employee & e)
16. {
17.      // copy constructor code
18.      return *this;
19. }
20. double computeSalary() const {
21.    double tax = salary * taxRate;
22.    return salary - tax;
23. }
24. };

25. int main(int argc, char **argv) {
26.    Employee e1 ("emp1", 10000), e2, e3;
27.    e3 = e2 = e1;
28.    Employee e4 = e1;
29.    cout << e4.computeSalary() << endl;
30.    return 0;
31. }
```

Starting at line 25, identify the order of the execution of the given C++ code. Specify the flow in terms of coding line numbers. For example:

- **Line 29 will transfer the control to line 20. Next, line 21, 22, and 23 will run.**

III.

. What is wrong in the code given below? Identify and explain the mistakes in a single paragraph. You should fix the code and find out the output. Submit the fixed code and the output.

Hint: do not search the syntax errors. You should think about the missing functionality.

```
#include<iostream>

class Int
{
    int num;
public:
    Int(int n = 0) : num(n) {}
    void displayOnScreen() {
        std::cout << n << std::endl;
    }
};

class AnotherInt
{
    int aInt;
public:
    AnotherInt(int a) : aInt(a) {}
};

void guess(Int i)
{
    i.displayOnScreen();
}

int main()
{
    AnotherInt ai(0);
    guess(ai);
    guess(0);

    return 0;
}
```

Long Questions:

3. **[12]**

Write a template class Calculator having following template functions

i. Add()

ii. Subtract()

iii. Multiply()

iv. Divide()

v. Modulus()

Test your code using different type inputs.

Note: Handle exceptions for string or character inputs.

4. **[15]**

A hospital wants to create a database regarding its indoor for many patients using oop programming concepts. The information to store includes structure of patients which include

- Name of the patient as string
- Date of admission in the form of day/month/year int
- Patient department as string
- Date of discharge same as date of admission format

Create a class **hospital** to store the above information, create another class to store the date (year, month and date as its members). It is mandatory to define **only one parameterized constructor in both** classes to initialize the values. Its mandatory to store the count of class patients registered in the system till now.

You need to ask user in a menu to select option for each feature you are going to implement in class **hospital**. You need to design menu driven application for 3 options; 1-deletion of any patient, 2-display patient, 3-insert a new patient and total number of patients registered in the system.

Hint: Better approach is to define function for insertion, deletion, display count and display patients.

You are not allowed to define count as global or main function variable. Use oop technique to deal this problem.

5. **[15]**

You are given an incomplete implementation of a Counter class. Additionally, some statements are provided in the main function to perform some task using Counter class. Your task is to implement the missing functionality so that we can compile the code without any compilation errors.

```
#include <iostream>
using namespace std;

class Counter {
    int count;
public:
    Counter(int c = 0) : count(c) { }

    // Write missing functionality here.
};

int main() {
    Counter c(10), b;

    cout << c++ << endl;

    b += ++c + c++;
    b = b + 12;

    cout << b << endl;

    return 0;
}
```

Good Luck ☺