

# Object Oriented Programming (CS1004)

## Sessional-II Exam

Date: April 6<sup>th</sup> 2024

Total Time (Hrs): 1

Total Marks: 30

Total Questions: 03

### Course Instructor(s)

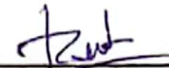
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23K-0701

Roll No

BCS-2C

Section



Student Signature

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Attempt all the questions.

**CLO #1: Discuss knowledge of underlying concepts of object-oriented paradigm like abstraction, encapsulation, polymorphism, inheritance etc.**

**Q1: Write short answers (2-3 lines) for the following questions: [15 minutes, 10 marks(5\*2)]**

- Do you agree with the statement: "When a function is declared a friend by a class, it becomes a member of that class"? Justify your answer.
- Can a constant member function be overloaded with a non-constant version?
- Can the diamond problem be mitigated explicitly disambiguating member function calls in the derived class?
- What will be the order of constructors and destructors in a code snippet given below:

```
class A { };  
class B { };  
class C : public B, public A { };  
class D : public C { };  
main() { D d1; }
```

- Is there any problem in a code snippet given below? If yes, how can we resolve it?

```
class A { public: int x; };  
class B : private A { };  
class C : public B { public: C() {x = 10; } };  
main() { C c1; }
```

**CLO #4: Design and assess small and medium scale C++ programs using OOP principles.**

**Q2: You are developing a software system to manage various security professionals and their roles within a firm. The system has a class hierarchy to represent different roles and entities involved in the industry. [20 minutes, 10 marks (4\*2.5)]**

- Create an Employee class that has basic information about individuals employed such as their name, employee ID, salary all of which are protected members. Create a parameterized constructor to set these attributes.
- Create an Analyst class that represents security analysts and inherits from the Employee class. It has additional attributes "specialization" and "isCertified". Create a parameterized constructor to set the attributes. The specialization can only be "Network", "Incident"



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Response", or "Threat Intelligence". The class has a function HasCertifications ( ). If the analyst has one certification then display that certification and if the analyst has more than one certification then display the list of certifications or else display "Not Certified".

- c. Create an Engineer class that represents security engineers and also inherits from the Employee class. It has additional attributes isExpert, isAssigned (initially set to false), and a list of projects which is dynamically allocated. Each security engineer works on at least 1 project. Create a parameterized constructor to set the attributes. The class has functions AddProjects( ) and AssignProject( ).
  - AssignProject( ) – The engineer is assigned a project if he/she is an expert. If the engineer is an expert set isAssigned to "True" or else set it to "False".
  - AddProjects( ) – If the engineer is assigned a project add the project to the list of projects or else display no projects to add.
- d. Create a class for Lead Professional who excels in both security analysis and engineering. Implement a functionality that shows the projects and certifications for the lead professional.

### CLO #4: Design and assess small and medium scale C++ programs using OOP principles.

Q3: You are required to develop a Software for a pastry shop located in UAE. The system should assist in managing the pricing, taxes, and profits from pastry sales. Each pastry has a production cost, and the price at which it is sold by the shop is subject to certain taxes and pricing regulations. Additionally, there is a requirement to calculate the retail price for each pastry, considering a 6% Goods and Services Tax (GST). [25 minutes, 10 marks (5\*2)]

Below are the detailed regulations:

- All pastries are subject to a 10% production cost markup to cover labor and other expenses.
- Sweet pastries are subject to an 8% sales tax, whereas savory pastries are subject to a 5% sales tax.
- After calculating taxes, the shop retains 70% of the retail profit from the total cost per pastry.

**Tasks:** The system should accommodate the following functionalities:

- a. **Pastry Classes:** Implement two classes, SweetPastry and SavoryPastry, derived from a base class Pastry. Each class should store information about the pastry name, ingredients, production cost, and tax rates specific to each type of pastry.
- b. **Polymorphism:** Utilize function overriding for the function(s) defined in the Pastry base class to calculate total cost, retail price, and profit for each type of pastry.
- c. **Friend Function:** Implement a friend function named PastryCalculator to perform specific calculations related to pastries. This function should calculate the total cost of a pastry, including taxes.
- d. **Friend Class:** Implement a friend class named PastryReport to generate a report of the total sales and profits for the pastry shop.
- e. **PastryShop Class:** Implement a class named PastryShop to manage multiple pastries. This class should allow adding pastries and calculating the total profit from all sales.

----- The End -----