

National University of Computer and Emerging Sciences
Karachi Campus

Object-oriented Programming Sessional-II Exam
(CS1002)

Date: 4/11/2024

Course Instructor

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Total Time: 1hr

Total Marks: 30

Total Questions: 03

Roll No

Section

Student Signature

Do not write below this line.

Attempt all questions.

CLO #2: Identify real world problems in terms of objects rather than procedure.

Question 1:

[15 points]

Carefully read the given scenario:

Xemy real estate and consultants try their best to provide their clients the best available properties. They want an automated system to manage their business affairs. The company has three separate business types, brokerage, marketing and leasing. Each of these business types have various offices. They need to maintain data about the office including its office code (a 3-letter code), revenue generated by this office, an office address and telephone number. There are many employees working at each of the offices. These employees are paid their salaries every month based on the number of working hours they give. The company assigns every new employee a permanent and unique employee ID although they do maintain employee names as well. For all business types, **Xemy real estate and consultants** have to file a tax report. Although this report can be different depending on the type of business.

Perform the following tasks:

- a) Identify and create all the classes (with proper relationships) present in the given scenario. Also add any required variables and arrays (but do not add any constructors or functions) to these classes with their appropriate data types.
- b) For classes created in Part (a), write all default and parameterized constructors to initialize the data members (variables and arrays). If there are any dynamic data members present in the class, they should be initialized properly with user-provided values.
- c) Add a mechanism such that every time an office is shut down, all employees working at the office are removed and have no connection left to the company. The same way, no offices should be allowed to exist for a business type if the company does not operate in that particular business anymore.
- d) Add a mechanism **View Amount** in the class **Business Type** that allows the company to view the total amount being paid in salaries to the employees currently working across all businesses and offices.
- e) If the business type is brokerage, the tax report should display half of the revenue generated by all of its offices combined. If the business type is marketing, the report should pick any three offices and display 1/5th of their combined revenue. For business type leasing, the tax report should display the total revenue generated by all of its offices minus the salaries paid to employees of these offices. Add a proper mechanism Tax Report in each individual business type.

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CLO #3: Illustrate Object-Oriented design artifacts and their mapping to Object-Oriented Programming using C++

Question 2:

[10 points]

Consider the given code and answer the following questions:

<pre>class Base { public: void action(int par) { } };</pre>	<pre>class Sub1: public Base { public: void action() { } };</pre>	<pre>class Sub2: public Base { int k; public: void action(int a) { } };</pre>
<pre>class Sub3: public Base { public: void action(int par) { } };</pre>	<pre>class Sub4: public Sub1, protected Sub2, public Sub3 { public: int k; };</pre>	<pre>int main () { Base b; b.action(5); Sub4 ob; ob.action(5); }</pre>

- Does the given code suffer from Diamond Problem? If yes, then provide a justification.
- If Diamond Problem is present in the given code, modify it to resolve this problem.

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

Question 3:

[5 points (1 each)]

True and False:

- It is not possible to create virtual constructors.
- Two overloaded functions having the same return type will cause the compiler to give an error when they are executed.
- It is possible to create multiple classes with the same name in a program if they do not contain any constructors.
- We can use member initialization list to assign a value to a member constant at runtime.
- We can call static member functions from within non-static member functions in a class.

- Good luck -