



COMSATS University, Islamabad (CUI)
Park Road, Tarlai Kala, Islamabad 45550, Pakistan
Department of Computer Sciences
Terminal Examination Fall-2024

Subject: CSC-241 Object Oriented Programming
Semester: BCS-III (A&B), BSE-III (A&B), BDS-III A, BDS-III B, BCT-III A

Instructor: Mr. Muzaffar Iqbal, Mr. Rizwan Rashid, Ms. Sajda Kulsoom, Ms. Bushra Naz, Ms. Haseena Kainat, Ms. Saneeha Aamir.

Dated: 8 Jan 2024

Marks: 50

Time: 180 mins

Instructions:

Use of mobile phones and calculators is not allowed.

Attempt all questions on the answer sheet.

Return the question paper along with the answer sheet.

CLO 1: Demonstrate fundamental principles and concepts of object-oriented programming.

1. Provide short answers to the following questions. (10 Marks)
 - i. Write example applications suitable for procedural and object-oriented paradigms respectively.
 - ii. What is meant by the state of an object?
 - iii. Which methods of a class qualify to be declared as private?
 - iv. Why a static method is unable to access the non-static data members of the class.
 - v. In an immutable class, how can getter functions for reference-type attributes be designed to prevent object modification

CLO 2: Apply the concepts of object-oriented programming principles along with interfaces and exception handling to solve a real-world problem.

2. You are required to write Java code for a folder management system using object-oriented principles. Consider the following scenario: (Marks:10)

A Folder Management System is designed to organize and manage a collection of Documents. A Folder consists of a set of Documents. The documents can be Emails and Files. All documents have an instance variable of type String named text that stores any textual content for the document. Email is a Document and includes instance variables for the sender, recipient, title of an email message and a readStatus to indicate whether the email has been read. File is also a Document and includes an instance variable for the pathName and fileType. The Folder class serves as a container for the Documents. The system allows users to perform the following functionalities:

- Add new documents (emails or files) to the folder
 - Print all details of each document in the folder.
 - Search for a specific word across all documents in the folder and display the results along with the document type where the word was found.
 - Count the emails in the folder which are read.
3. A new housing scheme has been introduced, offering two types of plots: Residential Plots and Commercial Plots, and a campaign has been launched to promote the sales. You have been assigned the task of designing a system using object-oriented principles to manage these plots and calculate taxes based on the customer's occupation. The system can be modeled using an abstract Plot class, that includes common attributes such as plotNumber, sizeInMarlas, cost, and a Customer to whom the plot belongs. The Customer class will have attributes such as name, age, and occupation. The tax calculation rules vary for Residential and Commercial Plots. For Residential Plots, if the customer's occupation is "Government", a 2% discount is applied to the price, followed by a 10% tax on the final cost. For Commercial Plots, if the customer is "Government", a 3% discount applies, and a 15% tax is applied.

Additionally, the system should include an interface `Advertisable` that includes method of `generateAdvertisementMessage()`. This method will showcase plot details, while will return a promotional message highlighting the features and benefits of the plot.

In the Runner Class, instantiate both `ResidentialPlot` and `CommercialPlot` and invoke the `calculateTax()` and `generateAdvertisementMessage()` method polymorphically to calculate the tax for each type of plot. **(Marks:10)**

4. As a software developer you are assigned the task to develop a generic method "swapElements" to process data in a variety of applications. The goal is to ensure that the method can operate on objects of any type. The method should accept an array of any type along with two indices and swap the elements at the specified positions.
Test the methods for list of any wrapper class. **(Marks:5)**

CLO 3: Create a program using standard libraries.

5. Create a Java application to manage books for a library using object oriented principles. The system should use permanent storage to store book information. The system should allow the following operations: **(Marks:15)**

- a. Add New Book:
 - i. Each Book should have a bookID, bookName and status.
- b. Borrow Book.
 - i. Borrow a book from the available stock. → AL
 - ii. Save the new state of Book object.
- c. Delete Book.
 - i. Delete a book based on bookID.
 - ii. Update the storage → AL

***** GOOD LUCK *****