Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Spring 2026

Course Code: SE-216 Course Title: Object Oriented Programming

Sections & Teachers: A-B (UKD), C-D (QFF), E-G (KM), H-J (SHN), K-L (RJM), M-N(TM), O (AZ)

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	**Illustrate** the "is a" and "has a" relationships in OOP by constructing a short code example for each.	[Marks-3]	CLO-3 *Level-3*
	b)	You are managing the inventory for a warehouse that tracks boxes of fruit. You need to handle incoming shipments and damaged goods. **Program** a `main()` method that performs the following operations: 1. Create an ArrayList called fruitStock and insert: Banana, Orange, Lychee, Mango, Apple. 2. A new shipment arrives. From index 2 onwards, insert: Pear, Grape, Date. 3. The warehouse manager realizes the Apple box is expired. Replace "Apple" with "Rotten Apple". 4. The first three fruits from fruitStock list are loaded onto a delivery truck. Extract these three fruits, print them and then remove them from fruitStock. 5. Check if the list contains "Mango". If it does, print its index; otherwise, print "Out of Stock". 6. Display the first and last item in the fruitStock. 7. Display the size of the fruitStock and then clear the fruitStock.	[Marks-7]	
	c)	A warehouse stores product names in a string array - `products` and their stock quantities in a parallel integer array - `quantities`. **Build** a Java program that attempts to look up a product at index and check its stock. Use nested try-catch blocks to handle the following cases: 1. If the index is out of bounds, catch `ArrayIndexOutOfBoundsException` and display: • `"Error: Product slot does not exist."` • If the index is valid, print `"Product found: <name>."` 2. Create a custom exception named `OutOfStockException`. Throw it if the quantity at that index is 0, displaying: • `"Out of Stock: <name> is currently unavailable."` • If quantity is greater than 0, print: `"In stock. Units available: <quantity>."` 3. Always print `"=== Inventory check complete ==="` at the end. All exceptions must be handled using **a single pair of nested try-catch blocks** — outer one for index out of bounds and inner one for product out of stock. Use the following hardcoded data –	[Marks-7]	

```
int index = 2;
String[] products  = {"Keyboard", "Monitor", "Mouse", "Headset"};
int[]    quantities = {15, 0, 8, 3};
```

d) **Program** a Java package named "test" that contains a class Balance with a method show() to print a message. [Marks-3]

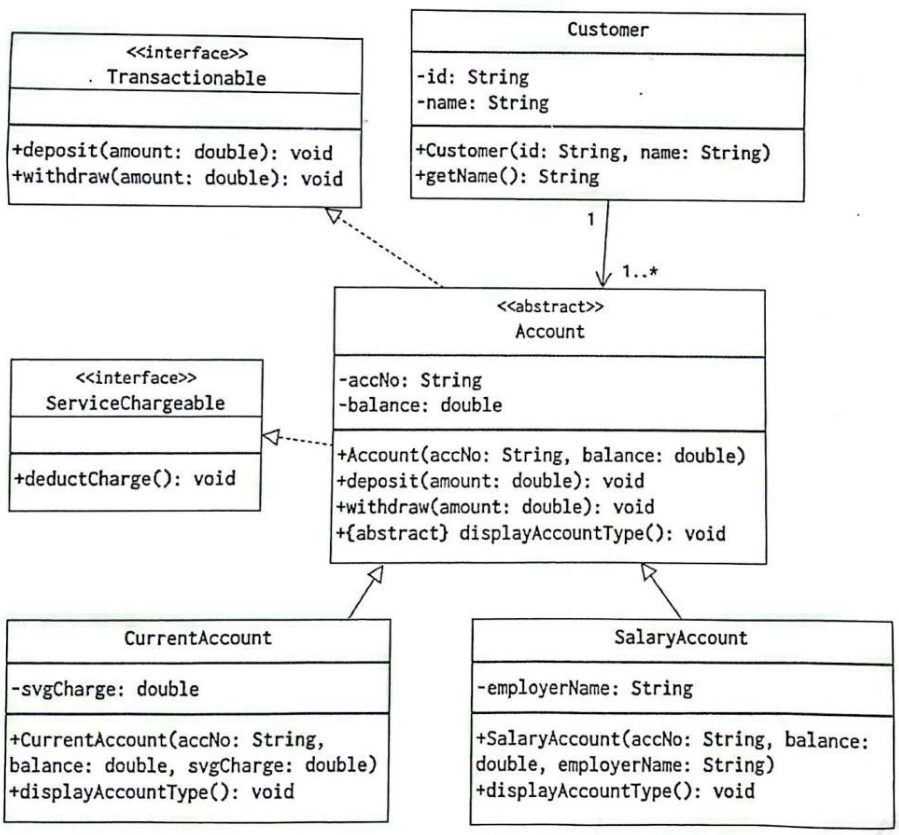
In a separate package "main", write another class Main that imports the "test" package, creates an object of Balance, and calls the show() method.

2. a) **Draw** a UML class diagram for a hospital management system that manages doctors and patients, based on the following requirements: [Marks-8] CLO-4 Level-3

- The system contains an abstract class Person with the attributes name (string) and age (integer), and an abstract method void displayInfo()
- There are two subclasses: Doctor and Patient, both derived from Person.
- The Doctor class contains
  - an additional attribute specialization (string) and
  - maintains a list of assigned patients using an array Patient[].
  - It also includes the methods void assignPatient(p: Patient) and int getPatientCount().
- The Patient class contains the additional attributes patientId (string) and diagnosis (string).

Your UML class diagram should clearly show classes, attributes, methods, constructors, access modifiers, inheritance and association relationship.

b) [Marks-12]



Translate the following UML class diagram of a Bank Account System into Java code, implementing all classes, the interface, attributes, constructors, methods, and relationships shown.