

# ITA5004 Object-Oriented Programming using JAVA.

## Answer All Questions

**Time: 3 Hrs**

**Marks: 10 X 10=100 Marks**

1. Implement a simple example illustrating types of inheritance. Also, demonstrate method overriding and dynamic method dispatch in the same example. Explain the use of access specifiers in this context. (10 marks)
2. Consider a scenario where you're tasked with developing a multithreaded ticket booking system for a movie theatre. The system must model each counter as a separate thread, manage a fixed number of seats while allowing for multiple seats to be booked simultaneously, and throw a custom "InsufficientSeatsException" when enough seats aren't available. The system should also enable the theatre management to instantly add seats, with the update reflecting across all counters. Your task is to create a thread-safe Java program to implement this system, explaining your approach towards thread creation, exception handling, and synchronization (10 marks)
3. Picture a scenario where you are tasked to develop a graphical user interface (GUI) for an online bookstore using Java AWT and Swing. The application should include components such as a display area for available books, buttons for actions like 'Add to Cart', 'Remove from Cart', and 'Checkout', and text fields for user input. Additionally, it should provide error messages for out-of-stock books or attempts to checkout with an empty cart. Your task is to create this GUI, demonstrating how various user actions trigger different events and discussing your design decisions regarding GUI components and event handling in Java.
4. Implement a large file processing system in Java which reads from multiple files simultaneously using both byte streams and character streams and uses Random Access File capabilities. (10 marks)
5. What are Generics in Java? Demonstrate each of them with suitable examples. (10 marks)
6. Implement a distributed application using RMI that demonstrates complex interactions between remote objects. The application should showcase the creation and use of stubs and skeletons. (10 marks)
7. Illustrate the life cycle of a servlet. Develop a web application with Servlets that handles client requests, accesses form data and interacts with a database. (10 marks)
8. Imagine you are asked to design a Java package named "geometry" that includes two classes: "Circle" and "Rectangle". In the "Circle" class, a private member for radius and methods for setting its value and calculating the area and circumference should be included. The "Rectangle" class should hold private members for width and height and methods to adjust these values and determine the area and perimeter. Upon the creation of this package, you should also develop a separate Java program that imports the "geometry" package and utilizes its classes to instantiate Circle and Rectangle objects. This program should assign dimensions to these objects and calculate and print their area and perimeter or circumference. Remember to ensure proper encapsulation of your package and adhere to Java naming conventions. (10 marks).
9. In the context of creating a school's database system where you need to manage a large number of student records, each including a student's name and grade, you are required to implement this scenario in Java using either an ArrayList or LinkedList. Your implementation should encompass operations such as adding multiple student records, removing a record, updating a student's grade, and traversing the list to print all records. Provide justification for your choice of either ArrayList or LinkedList. (10 marks)
10. Design a real-world simulation using a complex object-oriented model. This model should demonstrate the use of classes, object passing, overloading methods, and access control. Explain the use and implication of 'this', 'static', and 'final' keywords in your simulation. (10 marks)