



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN
COMPUTER SECURITY AND FORENICS, BACHELOR OF INFORMATION
COMMUNICATION TECHNOLOGY AND BUSINESS INFORMATION SYSTEMS**

1ST YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: ICB 3103

COURSE TITLE: INTRODUCTION TO PROGRAMMING

EXAM VENUE: LAB 11

STREAM: CSF, ICT & BIS

DATE: 13/1/25

EXAM SESSION: 14-16.00 HRS

TIME: 2.00 HOURS

INSTRUCTIONS:

- 1. Answer Question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on the question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE

[30 MARKS]

You are tasked with developing a Library Management System (LMS) for a local university library. The system should manage the library's collection of books, track the borrowing and returning of books, and manage users (students and staff). Below are the requirements:

- **Book Management:** The system should allow the addition, deletion, and modification of book details (Title, Author, ISBN, Year of Publication, and Genre).
- **User Management:** The system should allow registering new users, with each user having a unique ID and role (Student or Staff).
- **Borrowing and Returning:** Users should be able to borrow books, and the system should update the availability status of the books. The system should also track the return dates and generate alerts for overdue books.

Tasks: a) Design a class Book with appropriate attributes and methods to manage the books in the library. Implement at least three methods (e.g., addBook, deleteBook, updateBook). *(10 Marks)*

b) Implement a User class to represent users of the library. Include attributes for ID, name, and role. Implement methods to register a new user and retrieve user details. *(8 Marks)*

c) Write a method in the LibraryManagementSystem class that allows a user to borrow a book. The method should update the availability status of the book and record the borrow date. *(6 Marks)*

d) Discuss how you would implement exception handling in the LMS to manage situations where a user tries to borrow a book that is not available. Provide sample code for this scenario. *(6 Marks)*

QUESTION TWO

[20 MARKS]

You are developing a simple application that analyzes a list of student grades. The grades are stored in an array, and you need to implement the following features:

a) Write a Java method that takes an array of integer grades as input and returns the highest grade in the array. *(6 Marks)*

b) Write a method that calculates the average grade from the array and determines how many students scored above the average. *(8 Marks)*

c) Implement a Java program that utilizes control structures to display a list of grades in descending order using the Bubble Sort algorithm. *(6 Marks)*

QUESTION THREE

[20 MARKS]

a) Explain the concept of polymorphism in Object-Oriented Programming (OOP) and provide an example using Java code where polymorphism is utilized effectively. *(10 Marks)*

b) Consider a class hierarchy where Shape is the base class, and Circle, Rectangle, and Triangle are derived classes. Write a Java program that demonstrates polymorphism by using a method to calculate the area of different shapes. (10 Marks)

QUESTION FOUR

[20 MARKS]

a) Discuss the importance of exception handling in programming. What are the differences between checked and unchecked exceptions in Java? (6 Marks)

b) Write a Java program that reads data from a text file containing student names and their grades. The program should handle exceptions that might occur during file reading (e.g., file not found, I/O errors). (8 Marks)

c) Modify the program to write the processed student grades (e.g., adding a pass/fail status based on a threshold) to a new file. (6 Marks)

QUESTION FIVE

[20 MARKS]

You are required to develop a basic Java Swing application for a simple calculator.

a) Design a GUI interface using Java Swing that includes buttons for digits 0-9, basic operations (+, -, *, /), and a display area. Provide the code snippet for setting up this interface. (10 Marks)

b) Implement the event handling mechanism that performs calculations based on the user's input from the GUI. Ensure that the system can handle division by zero by displaying an error message in the display area. (10 Marks)

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