CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COSC 223: OBJECT ORIENTED PROGRAMMING

STREAMS: BSC. COMP SCI. **TIME: 2 HOURS**

DAY/DATE: MONDAY 14/04/2025 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS

- **Answer Question One and any TWO questions.**

Question One (30 marks)

(a) Using an illustrative example, **explain** the difference between Overloading and Overriding in Java programs. (6 marks)

(b) Describe the three types of variables in Java: local variables, instance variables, and class variables. Illustrate with a code snippet. (6 marks)

(c) Write a Java program that simulates a banking system where users can deposit and withdraw money. Ensure the program prevents overdrawing an account. (6 marks)

(d) Write a Java method that takes an array of courses offered in the department of Computer Science and returns all the courses whose CF is greater than 3.0. (6 marks)

(e) Students in their practical tasks were asked to write a Java Program to help students borrow library books for 3 hours and return them. Any extra hour spent with the book is charged Ksh. 100. Develop this Java program classes with the expected operations implemented. (6 marks)

Question Two (20 marks)

(a) Explain the role of a constructor in Java. Write a Java code snippet to demonstrate your answer. (4 marks)

(b) Discuss exception handling in Java. Write a Java program that demonstrates the use of `try`, `catch`, and `finally` blocks. (6 marks)

(c) A bank client would like a simple app to help track their Fixed Deposit investment. The client is required to deposit a principal amount, the bank computes interest monthly at a rate of 14% Per annum. The Interest becomes part of the investment principal for the next month. Develop a Java program logic that will demonstrate how this app will work for the client. (10 marks)

Question Three (20 marks)

(a) Discuss the differences between a constructor and a method using an example. (4 marks)

(b) Explain the concept of inheritance in Java and describe its advantages. Write a Java program that defines a superclass `Vehicle` and a subclass `Car` demonstrating inheritance. (6 marks)

(c) Meru Nissan Sacco intends to buy a software application for managing their fleet of vehicles. They wish to monitor the passengers using their vehicles for Maua, Meru, Nkubu, Chuka, Embu and Nairobi transport route. They have introduced advance booking services for passengers to reserve seats 7 days before their travel dates. Develop a Java application logic to perform their desired functions.

(10 marks)

Question Four (20 marks)

(a) Write a Java method to return a Person object whose date of birth is passed as an argument. The method takes a list of Person objects and a date of birth. (4 marks)

(b) Explain the role of interfaces in Java and write a simple Java interface named `Vehicle` with two methods: `startEngine()` and `stopEngine()`. Write a `Car` class that uses the `Vehicle` interface. (6 marks)

(c) Discuss the importance of handling exceptions in Java programs. Write a Java program that demonstrates throwing and catching a custom exception. (10 marks)

Question Five (20 marks)

(a) Using a sample Java code snippet, discuss the three access modifiers in Java program. (4 marks)

(b) Write a Java method to search a text file for the name “static IP Address”. The method returns the line number or numbers where the words are found. (6 marks)

(c) Write a Java program to model the operations of a student management system. The system has three classes: Student, Course, and Lecturer. A student takes a maximum of three courses in a session. A lecturer teaches only 1 course in a session. At the end of a session, a report of every student showing the scores in each of the three subjects shall be produced. The report shows grade for each course, the lecturer who taught the course and overall mean score and mean grade. (10 marks)

Sample report:

```
Student#1:
  Name:     James Otieno
  Reg. No:  56789
  Course code    Score     Grade     Lecturer
  COSC 100       71%       A         Dr Joel
  COSC 110       65%       B         Mr Kunga
  COSC 332       57%       C         Prof. Kiama

  Mean Score: 64.3    Mean Grade:    B
```