CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

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

ACSC 224: OBJECT ORIENTED PROGRAMMING II

STREAMS: BSC. APPLIED. **TIME: 2 HOURS**

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

INSTRUCTIONS

- **Answer Question ONE and Any other TWO Questions**

QUESTION ONE (30 MARKS)

(a) Write a Java program that demonstrates the use of method overloading with a `Calculator` class having methods to add two, three, and four numbers. (6 marks)

(b) Write a Java program that demonstrates the use of method overriding using both an interface and a subclass. (6 marks)

(c) Consider a University Student Management System where students enroll in courses. Draw a UML class diagram representing the relationships between `Student`, `Course`, and `Lecturer` classes. (6 marks)

(d) Write a Java method to search for an element in an array using binary search. The method should return the index if found or -1 if not found. (6 marks)

(e) Write a Java method to find if an element is in a list. The program should return true if element is in the list and false if the element is not in the list. The method takes a list of elements and the item to search for as an argument. (6 marks)

QUESTION TWO (20 MARKS)

(a) Explain the difference between aggregation and composition in Java, and provide UML representations for both. (6 marks)

(b) Write a Java class `AirlineReservation` that allows customers to book flights. Include attributes such as `flightNumber`, `customerName`, and `seatNumber`. Implement methods to book a flight, cancel a reservation, and display booking details. (10 marks)

(c) Describe the significance of exception handling in Java and demonstrate the use of `try`, `catch`, and `finally` blocks in a simple Java program. (4 marks)

QUESTION THREE (20 MARKS)

(a) Consider the system description provided below.

"A car rental agency has multiple offices/branches. The customer visits the agency for enquiry and takes a test ride then selects the car by signing the terms and conditions form. The customer can also book the car through telephone email and SMS. The agency checks the availability of the car and gives the status to the customer. The customer can also avail the driver facility if required, by paying additional charges. The billing is done based on the type of vehicle and distance travelled."

(i) Develop a use case diagram for the system (5 marks)

(ii) Develop a class diagram for the system (5 marks)

(b) A first year student interested in fixed deposits investing would like a simple Java application 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 that will demonstrate how this app will work for the client. Note the program logic should show the use of the class concept: attributes and methods. (10 marks)

QUESTION FOUR (20 MARKS)

Consider the system described below:

A system allows an existing customer to login. (For new customers, they first need to register). The airline has different destinations. A customer will choose their destination and select available airline planes scheduled for the day a customer wishes to travel. A customer

is also expected to select the time of departure from the available list of departures to the chosen destination. A customer cannot complete reservation before paying the flight cost. Once a customer pays the flight cost, they are asked to confirm their reservation. If they fail to pay the total cost of the flight, the reservation is cancelled.

(a) Design an activity diagram to model the sequence of activities in an airline reservation system. (6 marks)

(b) Using a sequence diagram, model the reservation process. (6 marks)

(c) Using Java, write the code to implement the above reservation process. (8 marks)

QUESTION FIVE (20 MARKS)

(a) Describe the Model-View-Controller (MVC) pattern and explain how it improves software design. (5 marks)

(b) Write a Java program that implements a `BankAccount` class with private attributes for account number and balance, and methods to deposit, withdraw (with exception handling for insufficient funds), and display balance. (10 marks)

(c) Explain the differences between an abstract class and an interface in Java with appropriate examples. (5 marks)

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