LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF EDUCATION (SCIENCE)

COMP 211: OBJECT ORIENTED PROGRAMMING I

STREAM: R ***TIME: 2 HRS***

DAY: MONDAY [11.30 A.M – 1.30 P.M] ***DATE: 26/01/2026***

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

SECTION A .

QUESTION ONE COMPULSORY (30 MARKS)

You are tasked with designing a simple Library Management System using Python and OOP concepts.

a) Elaborate a class Book with attributes: title, author, and ISBN. Write its constructor and a method display_info(). **(6 Marks)**

b) Explain how encapsulation can be applied to restrict direct access to the ISBN attribute. Provide code snippet. **(2 Marks)**

c) Discuss how inheritance can be used to create a DigitalBook subclass from Book that adds attributes like file_format. **(6 Marks)**

d) Illustrate how method overriding would allow DigitalBook.display_info() to extend the parent method. **(6 Marks)**

e) Using a UML class diagram, represent the relationship between Book and DigitalBook. **(6 Marks)**

f) Evaluate how abstraction and polymorphism could make the system scalable for different library resources (e.g., journals, magazines). **(4 Marks)**

SECTION B.

SECTION TWO CHOOSE ANY TWO QUESTIONS 4O MARKS. ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS EACH)

QUESTION TWO (20 MARKS)

A software company is developing a Payroll System.

a) Describe how classes and objects could be used to model employees and their salaries.**(6 Marks)**

b) Elaborate the role of constructors (__init__) in initializing employee details. **(4 Marks)**

c) Discuss how access modifiers (public, protected, private) can enforce data security in payroll applications. **(6 Marks)**

d) Evaluate why modularity in payroll code (using functions and modules) is essential for maintainability. **(4 Marks)**

QUESTION THREE (20 MARKS)

You are building a student records system with Python.

a) Show how exception handling can prevent program crashes when invalid data is entered (e.g., invalid student age). **(6 Marks)**

b) Describe the use of file handling (open, read, write) for storing student data persistently. **(6 Marks)**

c) Demonstrate how JSON serialization can be used to exchange student data between applications. **(4 Marks)**

d) Discuss the benefits of using pickle vs. JSON for saving Python objects. **(4 Marks)**

QUESTION FOUR (20 MARKS)

A tech startup is building an online shopping application.

a) Elaborate how inheritance could be used to model different product categories (e.g., Electronics, Clothing). **(6 Marks)**

b) Demonstrate how polymorphism allows a single function calculate discount() to behave differently for each product type. **(6 Marks)**

c) Interpret how duck typing in Python could allow third-party product objects to integrate with the system. **(4 Marks)**

d) Evaluate limitations of dynamic typing in large-scale shopping applications. **(4 Marks)**

QUESTION FIVE (20 MARKS)

You are asked to train junior developers on OOP principles.

a) Describe with examples the difference between abstraction and encapsulation. **(6 Marks)**

b) Discuss how method overriding and method overloading (simulated in Python) support polymorphism. **(6 Marks)**

c) Illustrate how a UML class diagram can guide developers in planning an OOP-based system. **(4 Marks)**

d) Evaluate how OOP principles lead to modular, scalable, and maintainable software. **(4 Marks)**