Strathmore
UNIVERSITY

SCHOOL OF COMPUTING AND ENGINEERING SCIENCES (SCES)
BACHELOR OF SCIENCE IN COMPUTER AND NETWORK SECURITY (CNS)
END OF SEMESTER EXAMINATION
CNS 1207: OBJECT ORIENTED PROGRAMMING

DATE:17th March 2025 Time: 11:00-13:00 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE **[30 Marks]**

The Kenya National Library Service (KNLS) is in the process of developing a new library management system to manage the borrowing of books and resources access. The library has different types of Books, such as the Reference Books (e.g. Kenya Law Reports and Historical Archives), and Regular Books (e.g. novels, school textbooks etc.). The new system allows the users to search for book locations using the title, the author and the ISBN.
Regular Books can be borrowed by all Library Patrons for different durations depending on the Patron's membership type i.e. (Student – 7 days, Adult – 14 Days, and Researcher – 30 Days). Reference Books cannot be borrowed but can be used within the library depending on the books Access Level (which determines who can access it). A Patron can check out multiple books. When a Patron checks out a book, the library system will log the borrowingDate and use it to calculate the amount due. If the book is overdue, the fine amount will be 1.5% of the amount due.

Task:

i) Identify any 5 Objects in the case study, and list their attributes **(5 Marks)**

ii) From the objects identified in (i) above, select any two (2) objects and draw a valid UML Object diagrams for them **(6 Marks)**

iii) Identify any inheritance relationship in the scenario and draw the UML Class diagrams for all the classes identified **(10 Marks)**

iv) Write valid Java Code to define one (1) of the classes in (iii) above **(5 Marks)**

v) Write a test class in Main.java, creating two instances of the class defined in (iv) above **(4 Marks)**

QUESTION TWO [15 Marks]

A. Differentiate between the following terms as applied in Object Oriented Programming:

i) Concrete classes and Abstract classes **(2 Marks)**

ii) Abstraction and Inheritance **(2 Marks)**

iii) Encapsulation and Polymorphism **(2 Marks)**

iv) Composition and Aggregation **(2 Marks)**

v) Source-code and Bytecode **(2 Marks)**

B. Explain the Java Compilation process **(5 Marks)**

QUESTION THREE [15 Marks]

A. Using code samples, differentiate between an **abstract class** and an **interface (6 Marks)**

B. System development is conducted by teams, located all over the world. Discuss how the use of interfaces can lead to improved productivity between the teams **(6 Marks)**

C. Using valid Java Code, show how one can add comments to code **(2 Marks)**

D. Define what a package is as applied in the Java Language **(1 Mark)**

QUESTION FOUR [15 Marks]

A. The Java Language supports 3 Access Modifiers. Name and explain the scope of each of the three access modifiers **(6 Marks)**

B. Enumerate the difference between **method overloading** and **method overriding** as applied in Object Oriented Programming **(4 Marks)**

C. Using valid Java code samples, explain what an exception is, and show how exceptions are handled **(5 Marks)**

QUESTION FIVE [15 Marks]

A. In what situations are abstract classes ideal to use? **(4 Marks)**

B. You are developing a system that will store data from a user to a database.

i) Write valid Java code to prompt the user to enter student ages and store them as an array structure **(5 Marks)**

ii) Compute the maximum, minimum, average and range of the ages entered by the user in (i) above, and display them to the user **(6 Marks)**