**Lab Exercise 5 - Creating a Class Diagram for Library Management System Using StarUML**

**Objective**

In this lab exercise, you will learn how to create a **Class Diagram** for a **Library Management System (LMS)** using **StarUML**. The diagram will represent the system’s main classes, attributes, methods, and relationships.

**Step 1: Install and Open StarUML**

1. Download and install **StarUML** from <https://staruml.io>.
2. Open **StarUML** and select **File → New Project**.
3. Choose **UML Model** to create a new diagram.

**Step 2: Identify Main Classes**

A **Library Management System** typically includes the following classes:

1. **Library** – Manages books and users.
2. **Book** – Represents books in the library.
3. **Member** – Represents library users.
4. **Librarian** – Manages book transactions.
5. **Transaction** – Records book borrowing and returning.

**Step 3: Create Classes in StarUML**

1. In **StarUML**, go to **Model Explorer → Right-click on Model → Add Diagram → Class Diagram**.
2. Select **Class** from the toolbar and place them in the diagram workspace.
3. Create the following **classes**:
   * **Library**
   * **Book**
   * **Member**
   * **Librarian**
   * **Transaction**

**Step 4: Define Attributes and Methods**

1. **Library**
   * **Attributes:** libraryName, location
   * **Methods:** addBook(), removeBook(), registerMember()
2. **Book**
   * **Attributes:** title, author, ISBN, availability
   * **Methods:** issueBook(), returnBook()
3. **Member**
   * **Attributes:** memberID, name, contactInfo
   * **Methods:** borrowBook(), returnBook()
4. **Librarian**
   * **Attributes:** employeeID, name
   * **Methods:** manageBooks(), issueBook(), receiveBook()
5. **Transaction**
   * **Attributes:** transactionID, issueDate, returnDate
   * **Methods:** recordIssue(), recordReturn()

**Step 5: Define Relationships Between Classes**

1. **Library → Book** (Aggregation: A library contains multiple books)
2. **Library → Member** (Association: Members register at the library)
3. **Library → Librarian** (Association: Library has librarians)
4. **Member → Transaction** (Association: A member can have multiple transactions)
5. **Book → Transaction** (Association: A transaction records a book loan)

To create relationships in **StarUML**:

* Select **Association, Aggregation, or Composition** from the toolbar.
* Connect the relevant classes.
* Label the relationships with **multiplicity (1..\*, 0..1, etc.)**.

**Step 6: Save and Export the Diagram**

1. Click **File → Save As** to save the project.
2. Click **File → Export As → PNG/PDF** to export the diagram.