**Problem Statement No. 6**

**Construct a class diagram for a geometrical document. Add at least 10 relationships (associations and generalizations). Use associations and association end names where ever required. Also use qualified associations and show multiplicity. You do not need to show attributes or operations. As you prepare the diagrams, you may add classes. Be sure to explain your diagrams.**

**1. What is UML?**

UML (Unified Modeling Language) is a standardized way to visualize system architecture. It helps in understanding class relationships, attributes, methods, and interactions between objects.

**2. UML Class Diagram for Your Java Program**

Your Java program is a **Matrix Operations System** that performs operations like **addition, subtraction, multiplication, transpose, determinant, and inverse** on matrices.

**3. Explanation of Classes & Relationships in UML**

Here’s how your UML class diagram would be structured:

**Classes in UML:**

1. **Matrix (Main Class)**
   * Attributes:
     + rows: Number of rows.
     + cols: Number of columns.
     + matrix[][]: 2D array for storing matrix elements.
   * Methods:
     + Constructors for matrix initialization.
     + Put() & Get() for inserting and retrieving matrix elements.
     + getRow(), getCol() for fetching dimensions.
2. **MatrixOpretion (Utility Class)**
   * Static methods for:
     + PrintMatrix()
     + AddMatrix(), SubMatrix(), MulMatrix()
     + Transpose()
     + det() (Determinant calculation)
     + Inverse()
3. **program4 (Main Class)**
   * Creates instances of Matrix.
   * Calls methods from MatrixOpretion.

**Relationships & UML Notation**

* **Association (MatrixOpretion → Matrix)**
  + MatrixOpretion operates on Matrix objects.
* **Composition (Matrix contains a 2D array)**
  + The matrix[][] array is an internal part of Matrix.
* **Dependency (program4 depends on MatrixOpretion)**
  + program4 calls MatrixOpretion methods.

