**Module 1(Design Patterns and Principles)**

**Exercise 1: Implementing the Singleton Pattern**

**Solution Code:**

public class SingletonPatternExample {

    public static void main(String[] args) {

        Logger logger1 = Logger.getInstance();

        Logger logger2 = Logger.getInstance();

        logger1.log("This is the first log message.");

        logger2.log("This is the second log message.");

        if (logger1 == logger2) {

            System.out.println("Both logger instances are the same. Singleton confirmed.");

        } else {

            System.out.println("Different logger instances found. Singleton FAILED.");

        }

    }

}

class Logger {

    private static Logger instance;

    private Logger() {

        System.out.println("Logger instance created");

    }

    public static Logger getInstance() {

        if (instance == null) {

            instance = new Logger();

        }

        return instance;

    }

    public void log(String message) {

        System.out.println("Log: " + message);

    }

}

**Output (Exercise 1):**

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**Exercise 2: Implementing the Factory Method Pattern**

**Solution Code:**

interface Document {

    void open();

}

class WordDocument implements Document {

    public void open() {

        System.out.println("Opening Word Document");

    }

}

class PdfDocument implements Document {

    public void open() {

        System.out.println("Opening PDF Document");

    }

}

class ExcelDocument implements Document {

    public void open() {

        System.out.println("Opening Excel Document");

    }

}

abstract class DocumentFactory {

    abstract Document createDocument();

}

class WordDocumentFactory extends DocumentFactory {

    public Document createDocument() {

        return new WordDocument();

    }

}

class PdfDocumentFactory extends DocumentFactory {

    public Document createDocument() {

        return new PdfDocument();

    }

}

class ExcelDocumentFactory extends DocumentFactory {

    public Document createDocument() {

        return new ExcelDocument();

    }

}

public class FactoryMethodTest {

    public static void main(String[] args) {

        DocumentFactory wordFactory = new WordDocumentFactory();

        Document wordDoc = wordFactory.createDocument();

        wordDoc.open();

        DocumentFactory pdfFactory = new PdfDocumentFactory();

        Document pdfDoc = pdfFactory.createDocument();

        pdfDoc.open();

        DocumentFactory excelFactory = new ExcelDocumentFactory();

        Document excelDoc = excelFactory.createDocument();

        excelDoc.open();

    }

}

**Output (Exercise 2) :**

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