Midterm 3 Question 1

Submit a PDF, PNG or JPEG

5 marks

You must add your CCID to your answer

Sequence Diagram of Test First or Test Driven Development from Developer Perspective

Draw a UML sequence diagram demonstrating the software development process of test first.

Use the following classes and actors: Developer (the developer), TargetClassTestCase (Testcases for TargetClass), TestRunner (the thing that runs test cases), TargetClass (the class being Test First or test driven designed and tested). Don't include irrelevant objects like IDEs or source code files, focus on the important classes and actors. *Demonstrate how the Developer executes test driven development to make TargetClass*. It should be a relatively high level sequence diagram from the Developer's point of view (like a scenario you would derive a "use case basic flow" from).

 Summary: Draw a sequence diagram of the test driven development of the class TargetClass.

Remember to include all the actors, components, lifelines, and activation boxes. Use good names for the methods.

Midterm 3 Question 2

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5 marks

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Composite Pattern Refactoring (Java Code to UML Class Diagram)

Restructure this code with the composite pattern and provide a UML class diagram depicting the structure and operations one would expect after refactoring this code to use a composite pattern instead of external recursive evaluation. **Draw the resulting UML class diagram of the refactored code.**

Refactoring should result in a change in the last line of Driver's example method.

This code represents a simple filesystem with files and folders. The goal is to get the size of a file or folder and all of its contents.

Draw a well-designed UML class diagram to represent this information. Provide the basic abstractions, attributes, methods, relationships, multiplicities, and navigabilities as appropriate. "..." means much code is omitted.

Do NOT submit Java code!

```java
// Represent a File or a Folder
abstract class Inode { }
// Represents a File with a size
class File extends Inode {
    private int size;
    File(int size) {
        this.size = size;
    }
    int getSize() { return size; }
}
// This class represents a directory or folder that contains files and folders.
class Folder extends Inode {
    private Inode[] children;
    Folder(Inode[] children) {
        this.children = children;
    }
```

```java
    Inode[] getChildren() {
        return children;
    }
}
// This class calculates the recursive size of files and folders.
class CalculateSize {
    // This static method calculates the size of files and folders.
    static int calculateSize(Inode inode) {
        if (inode instanceof Folder) {
            int totalSize = 0;
            Inode[] children = ((Folder)inode).getChildren();
            for ( int i = 0 ; i < children.length; i++ ) {
                totalSize += calculateSize( children[ i ] );
            }
            return totalSize;
        } else {
            return ((File)inode).getSize();
        }
    }
}
class Driver {
    static void example() {
        Inode folder1 = new Folder(new Inode[] { new File(1), new File(2) });
        Inode folder2 = new Folder(new Inode[] { new File(3), new File(4),
folder1});
        Inode folder3 = new Folder(new Inode[] { new File(5), new File(6), folder2
});
        Inode folder4 = new Folder(new Inode[] { new File(7), folder3 });
        Inode folder = new Folder(new Inode[] { folder4 });
        System.out.println("" + CalculateSize.calculateSize( folder ));
    }
}
```

Midterm 3 Question 3

*Submit **1** plain text, **1** .java, or **1** .zip of .java **only.***

 I prefer 1 text file over a .zip! Use an editor!

5 marks

You must add your CCID to your answer

Factory Method Pattern Refactoring (UML to Java code)

You are designing an application that converts an array of characters into an array of tiles for a videogame. The maps are load from 1-d arrays of ASCII characters and they need to be converted into a 1-D array of tiles. Think of side scrolling games and the maps they use. This UML class diagram shows the current design of your system. It is too complicated. Get rid of the TileFactories and refactor it using the Factory Method pattern as skeletal Java code. The parts of the Factory Method Pattern should be clearly labelled in comments in your code.

Character '`.`' (period) converts to Dirt: OurDirt.

Character '`~`' (tilde) converts to Water: OurWater

So '`~~~.`' Is Water Water Water Dirt. Or from the OurTileFactory: OurWater, OurWater, OurWater, OurDirt.

 ONLY make Java code for TileMap, OurWater, OurDirt, and the "Our" themed Factory Method Pattern implementation. You need to provide code to convert characters to your tiles (the default tile is water). You can use the magic '...' to indicate missing code, but you should name your methods well enough for anyone to understand what is missing.

Do NOT submit UML, submit Java code!

 Here's an example driver that will drive the code described by the UML diagram. You'll have to change 1 line so it doesn't use a TileFactory and uses your factory method pattern instead.

 [

```java
class ExampleDriver {
    static void example() {
        Tile[] expectedOutput = { new OurDirt(), new OurWater(),
                                  new OurDirt(), new OurDirt(),
                                  new OurDirt(), new OurWater() };
        char[] input  = ".~...~".toCharArray();
        TileMap tileMap = new TileMap(new OurTileFactory()); // change this line
```
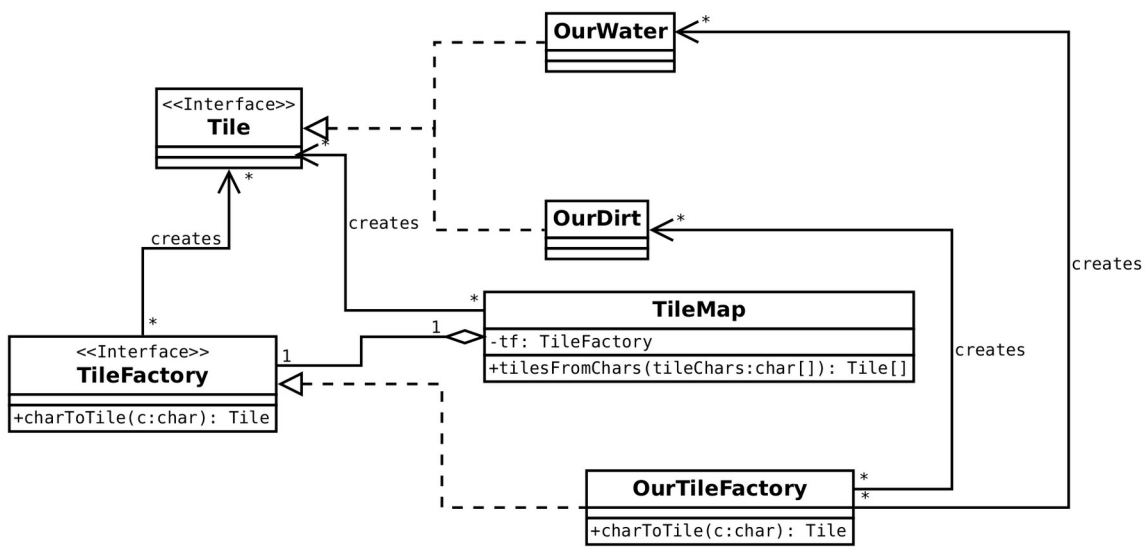
```java
        Tile[] output = tileMap.tilesFromChars( input );
        for (int i = 0 ; i < expectedOutput.length; i++) {
            assert(Objects.equals(expectedOutput[i], output[i]));
        }
    }
}
```

]

Midterm 3 Question 1

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<u>Scenario to Sequence Diagram</u>

Convert this scenario into a sequence diagram, remember to include all the actors, components, lifelines, and activation boxes. Use good names for the methods.

I have a CSV* file that contains data about employees, and I want to upload it to the Human Resources web-based system. On the Import page, I upload my CSV file and click "Verify". The Import page sends the file to the backend. The backend parses the file. Then, it validates the data for correctness. Next, the backend queries the database to see if there are no duplicates. If there are any issues, the backend returns the error message, which is displayed to me. If there are no errors, I see the "Confirm" button. I click "Confirm", and the backend adds the data to the database. The database returns the number of rows added. I see the message "N rows added successfully".

* Comma Separated Values (CSV) file is a plain text file that contains a list of data.

Midterm 3 Question 2

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5 marks

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Composite Pattern Refactoring (Java Code to UML Class Diagram)

This code represents a shop that packs orders for delivery. Items can be packed in boxes. Each box can have items and other boxes with **unlimited** nesting of boxes. **The goal is to get the price of an item or a box and all of its contents.**

Restructure this code with the composite pattern and provide a UML class diagram depicting the structure and operations one would expect after refactoring this code to **use a composite pattern <u>instead of external recursive evaluation</u>**.

Draw the resulting UML class diagram of the refactored code. Provide the basic abstractions, attributes, methods, relationships, multiplicities, and navigabilities as appropriate. "..." means much code is omitted.

```java
public class Item {
    private int price;

    public Item(int price) {
        this.price = price;
    }

    public int getPrice() {
        return this.price;
    }
}

public class Box {

    // We pack items into boxes
    private ArrayList<Item> items = new ArrayList<Item>();

    // Sometimes we need to pack boxes inside boxes
    private ArrayList<Box> innerBoxes = new ArrayList<Box>();

    public void addItem(Item item) {
        items.add(item);
```

```java
        }

    public ArrayList<Item> getItems() {
        return items;
    }

    public void addInnerBox(Box box) {
        innerBoxes.add(box);
    }

    public ArrayList<Box> getInnerBoxes() {
        return innerBoxes;
    }

}

public class Client {
    public static void main(String[] args) {
        // Packing two items into box1
        Box box1 = new Box();
        box1.addItem(new Item(30)); // this one costs $30
        box1.addItem(new Item(20)); // this one costs $20

        // Packing box1 + another item into box2
        Box box2 = new Box();
        box2.addInnerBox(box1);
        box2.addItem(new Item(100)); // this one costs $100

        // Calculating total price of all items in box2
        int totalPrice = getTotalPrice(box2);
        System.out.println("Total price of items in the box: " + totalPrice); // $150

    }

    // Calculate the total price of the items in a box
```

```java
    public static int getTotalPrice(Box box) {
        int totalPrice = 0;
        for (Item item : box.getItems()) {
            totalPrice += item.getPrice();
        }
        for (Box innerBox : box.getInnerBoxes()) {
            totalPrice += getTotalPrice(innerBox);
        }
        return totalPrice;
    }


}
```

Midterm 3 Question 3

Submit 1 plain text, 1 .java, or 1 .zip of .java only.

I prefer 1 text file over a .zip. Use an editor!

5 marks

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Template Method Pattern Refactoring (UML to Java code)

You are designing an application that converts files of different formats to PDF. There is a UML class diagram that shows the current design of your system. **Refactor it using the Template Method pattern as skeletal Java code**.

You can use the magic '...' to indicate missing code, but you should name your methods well enough for anyone to understand what is missing.

Do NOT submit UML, submit Java code!

HtmlToPdfConverter
+convertHtmlToPdf() +parseHtml() +parseStyleSheets() +loadLinkedImages() +generatePdf() +savePdf()

Steps:
1. Parse HTML
2. Parse style sheets
3. Load linked images
4. Generate PDF
5. Save PDF

DocxToPdfConverter
+convertDocxToPdf() +parseDocx() +loadEmbeddedImages() +generatePdf() +savePdf()

Steps:
1. Parse DOCX
2. Load embedded images
3. Generate PDF
4. Save PDF