

Midterm 2 Question 1

Plain text preferred. Alternatively, submit PDF, PNG or JPEG

5 marks

You must add your CCID to your answer

CRC Cards

Engage in Object-Oriented Analysis and read the following scenario paragraph and pull out potential nouns that may lead to classes and verbs may lead to methods or relationships.

Make CRC cards to model each meaningful class relevant to the problem and scenario. Collaborators and responsibilities must be described.

You may use plain text, separate the cards by a blank line. The following format is recommended:

Class: X

Collaborator: Y

Collaborator: Z

Responsibility: K

Responsibility: L

Responsibility: M

Your customer described their scenario:

My walk to work is often impeded by neighbors who have not shoveled the snow from the sidewalk in front of their homes. I have to record addresses and dates so that later when I get to a computer I can use the City of Edmonton's 311 snitch website to report these lapses in snow removal. Often I have to report the same home numerous times a season. The report contains the date, the address, the offense (lack of snow shovelling), and my contact information. I've made a semi-automated system that fills out the website for me, it maintains a database of homes that I have reported, and it can submit multiple reports for me.

Midterm 2 Question 2

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Cohesion and Coupling

Interpret the Java code below, consider which class has poor measures of coupling and cohesion. It is based on the FillerCreep game that was discussed in class, where 2 players, 1 human, 1 AI battle out over who controls the universe. Each round each player chooses 1 kind of stuff (Matter, Energy, Space) and if their player blob is touching any of that stuff, they fill flood / expand into the stuff of that type. The game includes a map of Stuff, an AI, a Player and the game rules.

Refactor/restructure this code **AS A UML CLASS DIAGRAM OF RESTRUCTURED CODE** to improve its coupling and cohesion. The improvement should be significant.

Improvement doesn't mean increase, it depends on the measure we're talking about.

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.

```
public interface Stuff { /* ... */ }
public class Matter implements Stuff { /* ... */ }
public class Energy implements Stuff { /* ... */ }
public class Space implements Stuff { /* ... */ }
public interface Player { /* ... */ }
public class FillerCreep {
    // The map / universe for the game FillerCreep
    protected Stuff[][] universe;
    protected Player[] players;
```

```
protected int[] scores;
```

```
public FillerCreep() { /* ... */ }
```

```
// Fill the region on the map of type toReplace with replaceWith
```

```
protected Stuff[][] fillFlood(int x, int y, Stuff toReplace,  
    Stuff replaceWith) { /* ... */ }
```

```
// Plays the human player's turn
```

```
// 1. this will fill flood your choiceOfStuff
```

```
// and increase the player's holdings
```

```
// 2. this will calculate new scores
```

```
public int playPlayer(Player player, Stuff choiceOfStuff) { /* ... */ }
```

```
// Plays the computer / AI player's turn
```

```
// 1. this will fill flood the AI's choiceOfStuff
```

```
// and increase the AI player's holdings
```

```
// 2. this will calculate new scores
```

```
public int playAIPlayer() { /* ... */ }
```

```
// make a copy of the universe
```

```
private Stuff[][] cloneUniverse() { /* ... */ }
```

```
public Stuff[][] getUniverse() { return universe; }
```

```
// Helpful method for the AI to test what is the
```

```
// score of a possible move.
```

```
public int testMove(Player player, Stuff choiceOfStuff) { /* ... */ }
```

```
// Is the game over?
```

```
public boolean isGameOver() { /* ... */ }
```

```
/* ... */
```

```
}
```

Midterm 2 Question 3

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Use Case

Write a textual use case for the task of cheating at playing of the game Wordle. Wordle is a mastermind-like game where you guess a secret 5 letter word within 6 tries. The Wordle game tells you if letters in your guess are in the word but not the right spot (yellow), not in the word (grey), or exactly where they should be (green). For instance here's a game I played recently where I guessed CRANE first and then eventually got RUPEE. The point is that this game is hard, and I have a computer so why not use it to reduce possible options?

C	R	A	N	E
T	O	Q	U	E
P	U	R	E	E
R	U	P	E	E

Scenario of Wordle Trainer

I open a game of Wordle, a guessing game for words. I guess a word and it gives me hints about what letters are in the hidden word. Using my vocabulary and brain is for chumps so I use Wordle Trainer. Wordle trainer filters out the dictionary of possible answers based upon constraints that I add.

Usually I start a game of wordle and I ask Wordle Trainer for a good starter word. Wordle Trainer provides a ranked list of words I should choose to maximize my chances of guessing a word sooner, in this case “CRANE” is at the top of the list. I type “CRANE” into wordle, and wordle says R is in the secret word but not where it should be, and E is in the right spot. I scan the wordle screen with my Wordle trainer app, it complains I didn’t capture the wordle screen right so I have to do it again. I scan the wordle screen with my Wordle trainer app and it then gives me a ranked list of words with TOQUE being the top word. I type in TOQUE and I find that U is in my word, but not there, and E is where it should be, the secret word doesn’t contain T, O, or Q. I scan the wordle screen with my Wordle trainer app, and it then gives me a ranked list of words with PUREE being the top word. I type in PUREE and I find that U,E,E are where they should be, but P and R are in the word but not in the right spots. I could use my brain and solve it but I am lazy, so I scan the wordle screen with my Wordle trainer app, and it then gives me a ranked list of words with RUPEE being the top word. I type in RUPEE to Wordle and I have won.

Include the following elements:

- Use case name
- Participating actors
- Goal
- Trigger
- Preconditions
- Postconditions
- Basic flow
- One exception

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**Class: X
Collaborator: Y
Collaborator: Z
Responsibility: K
Responsibility: L
Responsibility: M**

We've had a lot of snow this winter in Edmonton. I know that there are many elderly people in my neighbourhood. I want to help them shovel their sidewalks. To do that, I call a volunteer coordinator of the "Shoveling Together!" program and ask them to sign me up. Once I'm registered, I receive a link to the shared spreadsheet with a list of elderly who need help this week. I open the spreadsheet and choose a person who lives close to me, her name is Joanne. In the spreadsheet, I indicate that I can help Joanne. Then, I contact Joanne to confirm the date and time. I come over and shovel Joanne's sidewalk. The volunteer coordinator calls Joanne and asks her to review my work. Later, I receive her review by email.

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```
class Office {
    int currentOccupancy;
    int maxOccupancy;
    int floor;
    // ...
}

class Developer {
    double getSalary() {
        // ...
    }
    // ...
}

class Tester {
    double getSalary() {
        // ...
    }
    // ...
}
```

```
class Designer {
    double getSalary() {
        // ...
    }
    // ...
}

class Department {
    String departmentName;
    Office office; // the office where the department is located
    ArrayList<Developer> developers;
    ArrayList<Tester> testers;
    ArrayList<Designer> designers;

    double getTotalSalary() {
        double totalSalary = 0;
        for (Developer developer : developers) {
            totalSalary += developer.getSalary();
        }
        for (Tester tester : testers) {
            totalSalary += tester.getSalary();
        }
        for (Designer designer : designers) {
            totalSalary += designer.getSalary();
        }
        return totalSalary;
    }
    // ...
}
```


Midterm 2 Question 3

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Use Case

Write a use case for the task of making a takeout order at a coffee shop based on the following scenario.

I want a bagel so I open the Tim Hortons mobile app to make a takeout order. I select the most convenient location which is 7441 76 Ave. Then, from the list of bagels, I choose a Jalapeno Asiago Mozzarella Bagel. The app automatically checks with the selected location. It shows a pop-up message. The pop-up has a light red background and a sad face emoticon. It says that they are out of Jalapeno Asiago Mozzarella Bagels today. I select a Four Cheese Bagel instead, and it's in stock. I'm presented with several options, and I choose to add vegetables to my bagel. I add my bagel to the cart and tap Next. I check my order and proceed to payment. I pay \$2.19 with my credit card and receive an order confirmation.

Include the following elements:

- Use case name
- Participating actors
- Goal
- Trigger
- Preconditions
- Postconditions
- Basic flow
- One exception