CSCM94 2022

Q1 – 概念题

(a) – 莱斯格(Lessig)的四种规约

Question 1

a) Cloud computing has become the foundation upon which much of our frequently used digital apps are built upon. Platforms such as Amazon Web Services, Microsoft Azure and Google Cloud have changed the way that data is stored and the ability for systems to access enhanced computing power. Cloud computing can appear in our homes through smart speakers, supporting the social network services we use and everyday digital services such as calendars and emails.

Define and explain how to envision cloud computing interacting with each of Lessig's Four Modalities.

[8 marks]

> 定义云计算，并解释其如何与莱斯格（Lessig）的四种规约（法律、社会规范、市场、架构/代码）相互作用

b – 软件危机

b) Explain what is meant by the term *Software Crisis*. In your answer you should also discuss approaches that can be employed during software engineering projects to lessen the impact of the issues surrounding the software crisis.

[5 marks]

c – 敏捷Scrum方法论

c) During the courseworks for CSCM94/CSCM94J, you completed a group design and implementation of a piece of software named *'Cafe94'*. Based on your experience, propose a software methodology that could have been used during this process. You should provide a clear justification and reasoning for your choice.

[3 marks]

Q2 – 分析代码

Consider the following Java class that acts as a controller for a graphical user interface with an application:

```
public class GuessController implements Initializable {

  private final Random random = new Random();
  private int randomNumber;
  private int guessCount = 0;

  @FXML
  private TextField guess;
  @FXML
  private TextField result;

  @Override
  public void initialize(URL url, ResourceBundle rB) {
  randomNumber = random.nextInt(10);
  }

  @FXML
  void checkGuess(ActionEvent event) {
      if(Integer.parseInt(guess.getText()) == randomNumber){
      result.setText("Correct guess!");
      }
      else {
      guessCount++;
          result.setText("Try again. guesses: " + guessCount);
      }
  }
}
```

a – 解释代码

a) Describe what the above code implements.

[6 marks]

b – 提高代码阅读性

b) Discuss how the code could be changed in order to improve its readability.

[3 marks]

c – 代码错误❌

c) Discuss a potential error that could arise from the above code and provide a potential solution to the issue.

[6 marks]

Q3 – 画UML图

a – Class Diagram 类图

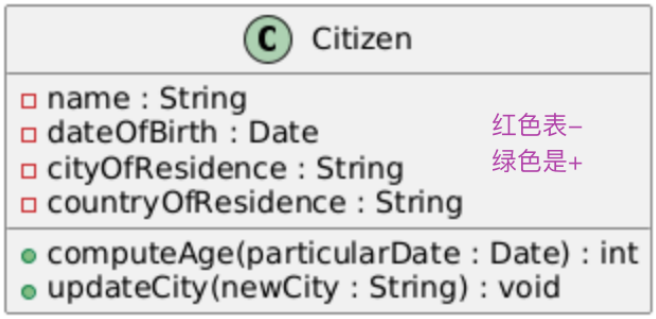
a) Consider the following class description:

The Citizen class holds information about a citizen's name, date of birth and city of residence, which are all required in the basic form of the class. Every instance of the Citizen class shares a piece of information called 'countryOfResidence'. The class provides functionality to compute a citizen's age based on a particular date and will return a whole number as a result of the function. The city of residence can be updated by another part of the system (such as another class) providing a new city is provided.

Draw a UML Class Diagram that provides a design for the class.

[7 marks]

1. **属性（Attributes）**
   - **name**：公民姓名（必需）。
   - **dateOfBirth**：公民出生日期（必需）。
   - **cityOfResidence**：公民所居住的城市（必需）。
   - **countryOfResidence**：公民所居住的国家（对于每个 Citizen 实例来说都需要保留该信息）。
2. **操作（Operations / Methods）**
   - **computeAge(particularDate: Date): int**
     根据传入的 particularDate 计算并返回公民的年龄。
   - **updateCity(newCity: String): void**
     将 cityOfResidence 更新为 newCity。题目说明此更新可能由系统中的其他部分触发。
3. **可选设计点**
   - 既然题目指出"每个实例都保存 countryOfResidence"，那么在类中直接定义此属性即可。
   - 对于日期类型，可以简单用 `Date` 表示，也可用其他更具体的类型（如 `LocalDate`）。
   - 在 UML 中通常将属性设置为私有（`-`），方法设置为公有（`+`）。当然，也可根据需求添加 getter/setter 方法。



```
@startuml
' 可以根据需要修改类名、属性、方法可见性与类型

class Citizen {
    – name : String
    – dateOfBirth : Date
    – cityOfResidence : String
    – countryOfResidence : String

    + computeAge(particularDate : Date) : int
    + updateCity(newCity : String) : void
}
@enduml
```

图形示例说明

1. `–` 表示私有属性（private）。
2. `+` 表示公有操作（public）。
3. 四个私有属性：`name`，`dateOfBirth`，`cityOfResidence`，`countryOfResidence`。
4. 两个公有方法：
   - `computeAge(...)`：根据特定日期计算返回年龄。
   - `updateCity(...)`：更新居住城市。

根据题目要求，**“每一个 Citizen 类的对象都有一块名为 countryOfResidence 的信息，并提供基于某个日期计算公民年龄的功能，以及可更新居住城市的功能”**，上述 UML 图已涵盖了这些需求。若在实现时需要更多的功能（如获取和修改国家的方法），可在类中继续补充相应的操作与属性访问器。

b –

b) Consider the following scenario:

A client would like a hotel booking system to be designed and implemented. In the system customers should be allowed to check in and check out of a room, as well as cancelling a room. During the check in/out processes, a receptionist is also involved. The receptionist can also issue a room key for a room. When a customer checks in, they have the option of including a breakfast with then booking (though no compulsory). When a customer checks out, a payment must be made immediately that is processed through a bank service. A member of the housekeeping team performs cleaning services on rooms.

Draw a Use Case Diagram that represents a design of the system.

[12 marks]

CSCM94 2023

Q1 – 概念题

a – 莱斯格(Lessig)的四种规约

Question 1

a) The emergence of social media platforms has changed many aspects of societal life for many individuals globally..

Define each of Lessig's Four Modalities and for each modality give an example of how social media affects society, or how it has been affected by society..

[6 marks]

b – 功能性与非功能性需求差异

b) Explain the differences between the functional and non-functional requirements. Provide an example of each requirement type.

[4 marks]

c – 敏捷Scrum方法论

c) Describe the Agile Scrum methodology. In your answer, you should discuss the stages and activities that take place.

[6 marks]

d – 重构（Refactoring）

d) Explain what you understand by the term Refactoring. Discuss when in a software engineering project this activity should take place and give two examples of a typical activity that happens during a refactoring process.

[4 marks]

Q2 – 分析代码

Consider the following Java class that acts as a controller for a graphical user interface with an application:

```
public class User {
  public String m;
  int printTimes = 1;

  /**
  * This method returns the name of the User
  * @return m - the name
  **/
  public void getName() {
  return m;
  }

  /**
  *  Takes the parameter newName and updates the m variable
  */
  public void setName(String newName) {
  m = newName;
  }

  public void SetPrintTime(int d) {
  this.printTimes = d;
  }

  public void print() {
        for(int i = 1; i < printTimes; i++) {
        System.out.println(m);
        }
  }
}
```

a – 代码错误❌和代码规范

a) Consider the coding conventions from CSCM94. Discuss how this code does not comply with these rules and suggest improvements to address the issues.

[6 marks]

b – 防止不良数据输入

b) The User class is part of a wider system that allows other classes to make calls to the public methods. There is potential for bad data to be passed into one of these methods. Describe steps that could be taken within the user class and the calling class to handle such an error.

[3 marks]

Q3 – 画UML图

a –

a) Consider the following class description:

A client would like a hotel booking system to be designed and implemented. In the booking system, a customer can request a booking and a receptionist handles the request. A customer can also checkin and checkout of a room with a receptionist. During checkin, a customer can optionally request breakfast for each morning of their stay. The receptionist can also issue a room key for a room. When a customer checks out, a payment must be made immediately that is processed through a bank service.

Draw a Use Case Diagram that represents a design of the system.

[10 marks]

b –

b) Consider the following class description:

A local shop wants to see an inventory system developed to keep track of stock it holds. The shop sells and buys CDs, Books, Magazines, Vinyls and Video Games

---

Identify candidate classes from the description box above and organise them into a class hierarchy. You should then draw out your hierarchy using standard UML conventions. You may be required to create classes that are not included in the description above.

If you need to write italic text, precede the text with a '/' symbol (e.g. /italicClass).

[7 marks]

c –

c) Consider your answer from 3b). The following responsibilities have been identified in the next stage of the design process:

- Store a unique reference number
- Store information about a music artists' name
- Store information about a publisher

Discuss a strategy for placing these responsibilities within your hierarchy and propose in which classes the newly identified responsibilities should be placed.

[4 marks]

CSCM94 2024

Q1 – 概念题

a – 敏捷模型和瀑布模型

(a) Agile and waterfall models are two categories of models for software engineering. Describe in 2 short sentences the primary differences between the two. **[2 marks]**

b – 功能需求与非功能需求

(b) Provide an example of a functional and of a non-functional requirement. Explain the difference between the two through these examples. **[3 mark**

c – 低保真与高保真原型

(c) Describe how Low Fidelity and High Fidelity prototypes can be used during a software engineering process. In your answer you should discuss when in the software engineering process they should be used. **[3 marks]**

Q2 – 画UML图

用例图 case diagram

Consider the Amazwan new book and DVD online store that services South Wales and the Valleys! Its online store shall follow the following specification:

There are no accounts for Amazwan or logins. The clients of Amazwan are the most common type of persona for the system. They can search for products. They can also select products from the current screen and put them into their shopping cart. They can also pay for their items through the checkout functionality which spawns a process for them to enter their credit card number.

If the customer places a DVD into their shopping cart (a special case of putting an item), the Media Inventory persona is notified. A Media Inventory persona can also perform inventory on all of Amazwan's DVDs.

If the customer places a book into their shopping cart, the Book Inventory persona is notified. A Book Inventory persona can perform an inventory on all their books.

Draw a use case diagram that depicts the above scenario. **[8 marks]**

Q3 – 画UML图

Class Collaborations

Consider the new mobile phone media service Msg94, which allows users to send and receive text, videos, and sound messages. Its specification is as follows:

Within the Msg94 application a traditional text message can be displayed and media forms of messaging can be both displayed and played. All messages can display their content and share a variable called 'messageCount' that is used to generate a unique ID for each message.

Text messages are classes that simply display the text of the message entered by the user. The class stores the text of the message and provides methods to set and retrieve this text.

Sound messages can both record audio provided by a user and also play audio messages that a user receives. Sound messages are recorded from a device microphone and stored in an array of integers called samples. The sound messages also have controls to lower and increase the volume of the message, with the volume being stored also as an integer to represent the volume level.

Video messages are recorded using a device camera and stored as an array of strings called videoStream. Like Sound messages, video can have volume levels increased and decreased. The video message class also allows for the rewind and fast-forwarding of content to be controlled, by skipping in increments of 5 seconds.

Video messages and Sound messages should be able to report on whether they are currently playing their audio or video content and provide information on the length of a recorded clip.

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a – 类层次结构设计

(a) Specify a good class hierarchy for all classes in the above description.

If you need to write *italic* text, precede the text with a '/' symbol (e.g. /classname).

[3 marks]

b – UML类图

(b) For text message and sound message only, draw full and correct UML class diagrams specifying all methods and attributes of these classes.

If you need to write *italic* text, precede the text with a '/' symbol (e.g. /classname).

[8 marks]

Q4 – 分析代码

Coding Conventions

Consider the following program:

```
import java.util.Scanner;

public class Readout {

    public static void main(String[] args) {
        Scanner myScanner = new Scanner(System.in);
        System.out.println("Please enter a number:");
        int myNumber = myScanner.nextInt();
        System.out.println("Please enter a character");
        char myChar = myScanner.next().charAt(0);
        myScanner.close();

        for (int i = 0; i < myNumber; i++) {
            for (int j = 0; j <= myNumber; j++) {
                System.out.print(myChar);
            }
            System.out.println();
        }
    }
}
```

a – 解释代码

(a) Describe what this code implements. **[3 marks]**

b – 代码错误❌

(b) Discuss any potential errors that exist in the code. **[3 marks]**

c – 修复代码错误

(c) Rewrite the code to fix any errors in the code provided and to handle any errors that a user may introduce into the system, while providing meaningful information back to the user. **[5 marks]**

d – 代码注释

(d) Add appropriate documenting comments to the code provided. **[2 marks]**

Q5 – 代码测试

Software Implementation

Consider the following code sample:

```
public class MyCalculator {
    public int add(int one, int two) {
        return one + two;
    }

    public double divide(double one, double two) {
        return two / one;
    }

    public int fancySum(int one, int two, int
       three){
        return (one + two) * three;
    }
}
```

a – 测试方法

(a) Write code to test each method to ensure they output expected results. **[7 marks]**

b – 大型程序测试策略

(b) Discuss a testing strategy that could be used if the code above were part of a larger program with several collaborations between classes. **[3 marks]**