CPT203 FINAL 21-22

Section A – Answer all questions (55 marks):

Question A.1 (12 marks)

List and explain FOUR principles that guide software engineering practice. (12 marks)（下面的题目也有体现这些内容，比如维护性和可封装拓展在后面的设计要求里面都有体现，答案具体出现在Week1，page16）

Answer: 1,Reusable: the code we write should be reuseable to reduce the cost

      2, Extendable: The software we design should be able to add additional function after we finish it

      3, Maintainable: The software should be able to be maintained simply

      4,Encapsulation: The code should be encapsuned to hide the details of our code to reduce the relay between each class

Question A.2 (12 marks)

i. Explain the term, non-functional requirement. (3 marks)（非功能性需求，答案在我们的week9，但是他没有直接给出）

A: non-functional requirement means the basic thing that our software should have, like stable and safety and so on.

ii. Explain why a non-functional requirement is often considered to be more critical than a functional requirement. (3 marks)（我没有找到原文，但是非功能需求的特性来说我们可以直接总结，他是基本属性，他决定了功能性需求能否正确被实现之类的）

A: Cause non-functional requirement are the basics of a software, if a software do not fit it, it even can not work, not to mention the requirment of users. Like you will never use a software that can not ensure your data safety or can not work smoothly while using.

iii. State TWO distinct non-functional requirements for the availability of the ticket vending machine. (2 marks)（同上，我们直接想想软件的基本属性就好）

A:1, data safety: the data of our customer should be absolutly safe

  2, Reply time should be short: If the time cost is higher than human methon, why we use the machine

iv. A common problem with non-functional requirements is that system users often propose these requirements as general goals, such as "The system should be easy to use by staff and should organize in such a way that user errors are kept to a minimum.". Re-write the non-functional requirement to improve its testability. (4 marks)（标准的应用，我们直接提炼他的内容，就是阅读理解）

A:1: The system should be able to record the error occuerd while users are using

　　2: The software should be able to let a new stuff use after 1 hour's training

　　3: The software should give the tips while error occured within user's using

Question A.3 (12 marks)(Week8，page7)

List FOUR software design model elements, and give a brief description for each of them. (12 marks)

1:context-level :transform architechal element into software comptent

2：Interface:describe how system communicate with human

3：class:transforms class models into design class

4:architechture:defines the relationship between major structural elements of the software,

Question A.4 (9 marks)

i. Explain the term 'Cohesion' and 'Coupling'. (4 marks)

A: Cohesion:The relation inside a function or class, the higher it is the better the code are

　　Coupling: The relation between classes, the lower it is the better your code are

ii. Consider the following class diagram of a sub-system for a university. The stakeholders have requested several operations to include in the system, as listed in the table below. Re-draw the class diagram to include the operations listed in the table. Your new class diagram must exhibit highly cohesive classes. (5 marks)

Operation	Description
Enroll seminar	Enroll a student in the seminar
Get average mark	Calculate and return the average mark for the student
Get final mark	Calculate and return the final mark for the student
Add student	Add student for a seminar
Drop student	Drop student for a seminar

Q2填表我们一起来弄，这个很简单，他要高内聚就是要我们class内部的属性关联度提升嘛，那我们在方法里面添加一点就好，比如学生我们加一个添加学生减少学生之类的，他要求高内聚，那么就对应相关的直接填进去就好，和学生相关就是加减学生，以此类推

Question A.5 (10 marks)

Suppose you have the following Calculator class which you want to test.

```java
public class Calculator {
    public int multiply(int a, int b) {
        return a * b;
    }
}
```

Fill up the following test class to complete the testing for the above Calculator class. Additional requirements are: - (10 marks)

- Use 4* 5 = 20 as the test case

- The test should run 5 times

- Make use of all imported classes.

```java
import static org.junit.jupiter.api.Assertions;
import org.junit.jupiter.api.BeforeEach;
import org.junit.jupiter.api.DisplayName;
import org.junit.jupiter.api.RepeatedTest;
import org.junit.jupiter.api.Test;

class CalculatorTest {
    ...
    void setUp() {
        ...
    }
    void testMultiply() {
        ...
    }
}
```

```
class CalculatorTest {
    private Calculator calculator;

    @BeforeEach
    void setUp() {
        // 在每个测试方法执行前初始化Calculator对象
        calculator = new Calculator();
    }

    @DisplayName("Test multiplication")
    @RepeatedTest(5)
    void testMultiply() {

        assertEquals(20, calculator.multiply(4, 5),
            "4 * 5 should equal 20");
    }
}
```

Section B – Answer all questions (45 marks):

Question B.1

Pack-and-Go is a company that operates an online tour reservation system. The company is growing fast. Its management is planning to phase out the old system. They are looking forward to a more efficient system. Our challenge is to design and implement a new system that not only meets the company's immediate needs but also is flexible enough to support other types of products in the future. Below is the description of the main activities that need to be supported by the new system: -

- The Create Reservation activity starts when a customer selects a tour package. Creating a new reservation involves selecting a tour package and tour date, adding tourists and contact information, and finally accepting payment for the reservation. The website only accepts an online payment that will involve the online payment gateway company.

- The Maintain Reservation activity starts when a reservation is modified in any way by a customer. It handles all aspects of the reservation modification, and it ends when the customer completes the reservation modification session.

- The Receipt Issuing activity is started by a clerk whenever a tour completes. It handles all aspects of receipt issuing, including the downloading of digital receipts by the customer. The status of the issuing of receipt for each reservation has to report to the accounting system.

- The Maintain Relationships activity is started by a customer service clerk, who is a special type of clerk, whenever a relationship with a customer requires special attention. It handles all aspects of Pack-and-Go's relationships with customers, and it ends when a relationship is either created or maintained for a customer.

- The Decision Support activity is started by a manager whenever a predefined or undefined request for information is made. It handles all aspects of decision support effort, and it ends when a reply is formulated for the inquiry.

Draw a Use Case Diagram for the online tour reservation system. (15 marks)（用例图不考）

Question B.2

You're creating a digital pet program. What happens to the pet when it receives different stimuli are determined by the state it's in. You decide to model the digital pet with a state machine diagram.

The behavior of the digital pet program is as follows:

- When the pet is turned on, it starts out happy

- If the pet is happy and receives punishment, then it becomes sad

- If the pet is happy and receives praise, it stays happy

- If the pet is happy and being ignored (no punishment nor praise) for more than 30 minutes, he will become sad

- If the pet is sad and receives praise, it becomes happy

- If the pet is sad and receives punishment, it becomes heart-broken

- The pet will remain heart-broken no matter what you do (either punishment or praise)

- You can turn off the pet at any state

Identify the states, actions, and transitions of the digital pet and draw a state machine diagram. (15 marks)

Question B.3

A hotel room reservation system works as below: -

- When a customer requests a room, the hotel employee looks for room availability.

- If there is no room available, the process will end.

- If there are rooms available, the employee will select a room.

- After a room is selected, the employee will enter the customer's credit card information for verification.

- While waiting for the credit card approval, the employee will enter the customer details.

- If the credit card verification fails, the room reservation process will terminate.

- Only if the credit card verification pass and the customer's details are entered, the employee can finally confirm the room reservation.

Draw an Activity Diagram to document the above system. (15 marks)