Xi'an Jiaotong-Liverpool University
西交利物浦大學

Module Code	Examiner	Email of Examiner	Tel
CPT203			

1st SEMESTER 2022/23 RESIT EXAMINATION

Undergraduate – Year 3

Software Engineering 1

Exam Duration: 2 Hours

INSTRUCTIONS TO CANDIDATES

1、 **This is a closed-book examination, which is to be written without books or notes.**

2、 **Total marks available are 100.**

3、 **This exam consists of two sections:**

Section A consists of SIX questions for a total of 55 marks.

Section B consists of THREE systems modelling questions for a total of 45 marks.

Answer all questions. There is NO penalty for providing a wrong answer.

4、 **Only English solutions are accepted.**

5、 **All materials must be returned to the exam supervisor upon completion of the exam. Failure to do so will be deemed academic misconduct and will be dealt with accordingly**.

Section A – Answer all questions below (55 marks):

Question A1. (6 marks)

List two measurements used to test the non-functional requirements of a system in terms of each of the following: -

a. Reliability.
b. Speed.
c. Usability.

Question A2. (8 marks)

A local restaurant wants to evaluate if and how the development of a mobile app can help them attract more customers. The restaurant has not yet developed such new technologies before. They don't know who will be the potential users of such a mobile app and wants to decide as soon as possible. Christmas is only two months away, the restaurant hope to launch the mobile app before Christmas. Because time is limited, they want to complete the most important features of the app first. They plan to add other less important features to the app in the future. They invite an IT team of XJTLU software engineers to work together. As a team member, will you suggest using agile methods? Or waterfall methods? What are the three main reasons for your choice?

Question A3. (6 marks)

The following is a structured specification of the requirement for "Top-up money in the machine for XJTLU Hope and Life's canteen card". Please identify THREE main problems in the following specification.

Function name	Top-up the prepaid canteen card
Description	Uses the Wechat Pay or Alipay to top-up the canteen card
Main actor(s)	The customer of XJTLU Hope and Life's canteens, card scanner
Pre-condition	The top-up machine must be in operation. The customer must have either Wechat Pay account or Alipay account to make the payment. The customer must have sufficient balance in their Wechat Pay or Alipay.
Post-condition	The customer must have a canteen card. The money is subtracted from Wechat Pay or Alipay. The canteen card is successfully topped-up by the same amount of money as the subtracted amount. The transaction is recorded in the system.
Main scenario	1. Customer puts the canteen card on the card scanner area 2. The machine displayed the current balance on the canteen card 3. On some occasions, customer scans a wrong type of card, for example, the student ID card 4. If wrong card is used, the machine prompts the customer to try again and goes back to step 2 5. The machine prompts the choices of payment 6. The customer clicks either Wechat Pay or Alipay 7. The machine prompts the customer to enter the amount of money 8. The machine prompts the message 'Please scan the payment QR code' while displaying the QR code 9. The customer scans the payment QR code to makes the payment 10. The machine displays the new balance, i.e. after the top-up
Exception Scenario	Exception 1 1. The machine is out of power. Exception 2 1. The customer's chosen payment method doesn't have sufficient balance. 2. The machine invites the customer to try again and goes back to step 6 of the main scenario.

Structured Specification

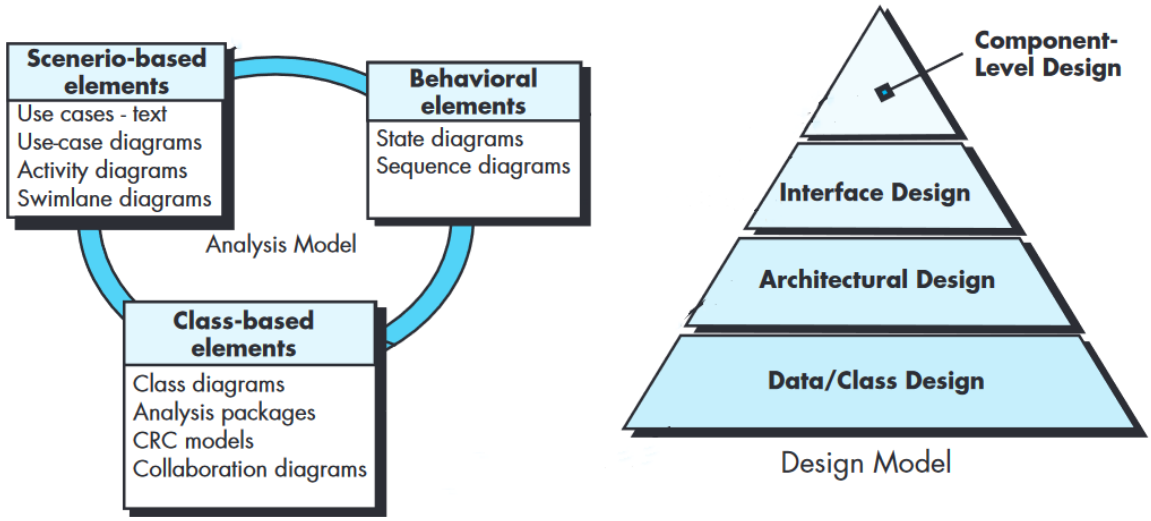
Question A4 (12 marks)

Risk identification is the first stage of the risk management process. Please list and explain SIX types of risks involved in a risk checklist.

Question A5 (11 Marks)

a. List FIVE attributes for a quality software design (5 Marks)

b. Refers to *Software Engineering: A Practitioner's Approach*, each of the elements of the analysis model provides information that is necessary to create the four design models required for a complete specification of design. Please reproduce the below diagram with the information flow between the elements in analysis model and design model. (6 Marks)



Analysis Model and Design Model

Question A6 (12 Marks)

The following MathTools class is a division calculator that can throw exception when the denominator is zero.

```
public class MathTools {
    public static double convertToDecimal(int numerator, int denominator) {
        if (denominator == 0) {
            throw new IllegalArgumentException("Denominator must not be 0");
        }
        return (double)numerator / (double)denominator;
    }
}
```

MathTools class

Complete the below skeleton to test the following case:

(a) 3/4 (6 marks)

(b) 3/0 (6 marks)

Please note that all the imported classes should be used.

```
import java.lang.IllegalArgumentException;
import org.junit.jupiter.api.Assertions;
import org.junit.jupiter.api.Test;

class MathToolsTest {

    void testConvertToDecimalSuccess() {

    }

    void testConvertToDecimalInvalidDenominator() {

    }
}
```

JUnit skeleton

Section B – Answer all requirements modeling questions below (45 marks):

Question B.1 (15 marks)

An airport passenger check-in has the following requirement.

When passengers check in to the airport for departure, they can choose to use counter check-in or kiosk check-in. At the counter check-in, a check-in clerk will process the check-in for the passengers. The passengers may do the baggage check-in in the counter check-in. If the passengers choose to use the kiosk check-in, they may print the Bag-Tag, which allows them to do the self-service baggage check-in later.

In a separate process, the passengers who printed Bag-Tag can stick the Bag-Tag to their baggage according to the instruction and do the self-service baggage check-in at the relevant self-service counter.

There will be an occasion when a tour guide requires group check-in for all passengers in his tour group. Group can only perform check-in at the counter check-in.

Due to the worldwide pandemic, all passengers must present the Nucleic Acid Test result during check-in.

You are required to draft a Use Case diagram to model the requirement and answer the following questions.

a) Who are the three actors you can identify from the requirement? (3 marks)
b) There are two types of check-in mentioned in the requirements. Draw a fragment of the use case diagram to show how you model the check-ins. (5 marks)
c) For the two types of check-in mentioned in question (b) above, suggest an extended use case for each of them, and illustrate the extended use case using a fragment of the use case diagram. (4 marks)
d) Using a fragment of the use case diagram, illustrate how you represent the requirement to check Nucleic Acid Test result in the process. (3 marks)

Question B.2 (15 marks)

An oven has the below behaviors according to its internal states. Draft a state machine diagram for the oven and answer the below questions.

- The oven is in an Idle state when it is turned on. If it is not in use, it will remain in the Idle state. In this state, the oven awaits the user's instruction.
- When the oven is in an Idle state, the user can press the setting button to set the temperature and the duration of the oven. In the setting states, the user presses the numerical button to set the temperature first. The user presses the "OK" button to confirm the temperature. After confirming the temperature, the user presses the numerical button again to set the duration. Again, the user presses the "OK" button to confirm the setting.

- After the setting for the temperature and the duration are confirmed, the oven is in the ready state. In the ready state, when the user presses the start button, the heater turns on to heat the oven. At this time, the timer begins to count down to the present duration.
- During the heating process, the user can press the cancel button anytime to cancel the cooking. If the user presses the cancel button, the heater will turn off, and the timer will reset, then the oven returns to the Idle state.
- When the timer timeout, the heater turns off, and the oven stops.

a) List the states of the oven. (5 marks)
b) Which state of the oven responds to the push of
    a. Start button? (1 mark)
    b. Cancel button? (1 mark)
    c. Setting button? (1 mark)
c) Using a fragment of the state machine diagram, show how you model the Start event (when the start button pressed). Your model must include the transition of states and the actions involved in the transition. (7 marks)

Question B.3 (15 marks)

An order processing system in a company works as follows:

- When the company receives a new order via email, the clerk will check its validity.
- If the order is invalid, the clerk will make a phone call to communicate with the customer. After communicating with the customer, the clerk will decide whether to amend the order or reject the order.
- If the clerk amends the order, the order will continue the order processing workflow after the amendment. If the clerk rejects the order, (s)he will inform the customer about the rejection, and the process ends.
- If the order is valid, it will continue the order processing workflow.
- After the order is validated or amended, two separate sequences of processes will run in parallel at two departments.
    - Warehouse Department
        - The warehouse department picks and packs the items according to the order.
    - Finance Department
        - When the finance department receives payment from the customer, they will update order records accordingly.
- The Shipping Department will arrange delivery only after the Warehouse Department and the Finance Department have completed the above tasks. They will arrange the delivery according to the order priority: -
    - If the order is a high priority, they will arrange overnight delivery.
    - If the order is a regular priority, they will arrange regular delivery.
- The process terminates after the order delivery is arranged.

Draft an Activity Diagram with Swimlanes to model the above process and answer the below questions.

a) List the actions in between the Fork and Join nodes. (2 marks)
b) Using a fragment of the activity diagram, show the actions and their flow in the Shipping swimlane. (6 marks)
c) List the name of the actions in the clerk's swimlane. (4 marks)
d) Using a fragment of the activity diagram, show the next step after the clerk call to communicate with the customer. (3 marks)

The end of the paper