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

Module Code	Examiner	Email of Examiner	Tel
CPT203			

SEMESTER 1, 2024/25 FINAL 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. Answer all questions.
4. There is NO penalty for providing a wrong answer.
5. Students should write the answer on the booklet(s) provided.
6. Only English solutions are accepted.
7. All materials must be returned to the invigilator upon completion of the exam. Failure to do so will be deemed as academic misconduct and will be dealt with according to the University's policy.

Question A (11 marks)

Suggest the most appropriate software process model that could be used as a basis for managing the development of the following systems, justify your suggestion:

A university sport center has been running for an online sport booking system for two years. Only university students and staff can make sport bookings. Now the sport center is planning to add a new function so that the public can also make sport bookings.

A1 What are the three most used software process models? (3/11)
A2 Provide a short explanation to these software process models. (3/11)
A3 Which is your choice of the software process model for this problem? (3/11)
A4 Provide a justification of your choice (2/11)

Question B (12 marks)

Compare agile development and the incremental model in the following three aspects
B1 Compare their differences in iteration (4 /12)
B2 Compare their differences in customer involvement (4/12)
B3 Compare their differences in documentation and planning (4 /12)

Question C (12 marks)

C1 What are functional requirements? (3/12)
C2 What are non-functional requirements? (3/12)
C3 Statement: This online shopping site should allow users to access it, via desktop, mobile devices and tablet. Is it a functional requirement or a non-functional requirement? (3/12)
C4 Statement: This online shopping site should allow users to order meals and make payment. Is it a functional requirement or a non-functional requirement? (3/12)

Question D (16 marks)

Creating a sequence diagram for a document approval system: the system allows a user to submit a document for approval, which is then reviewed by a manager. The sequence diagram should capture the following interactions:

D1 Submit Document: The user submits a document for approval. The system saves the document and notifies the manager. (4 /16)

- The User submits a document for approval to the System.
- The System saves the document and stores it in the Document Database.
- The Document Database confirms the save operation.
- The System confirms the submission to the User and notifies the Manager about the new document.

D2 Review Document: The manager reviews the document. The system retrieves the document

for the manager to review. (4 /16)

- The Manager retrieves the document for review.
- The System fetches the document from the Document Database.
- The Document Database returns the document data.
- The System provides the document data to the Manager.

D3 Decision Making: The manager reviews the document and decides whether to approve or reject the document: (4 /16)

- If the document is approved: The system updates the document's status to "Approved" and notifies the user.
- If the document is rejected: The manager provides feedback on why the document was rejected. The system updates the document's status to "Rejected" and notifies the user with the feedback.

D4 Resubmit Document (if rejected): The user can make changes based on the feedback and resubmit the document. The system saves the updated document and notifies the manager again. (4 /16)

- If the document is rejected, the User can make changes based on the feedback and resubmit the document.
- The System saves the updated document and stores it in the Document Database.
- The Document Database confirms the save operation.
- The System confirms the resubmission to the User and notifies the Manager again.

Question E (14 marks)

Create an activity diagram for an online course enrollment process: the system allows students to search for courses, enroll in selected courses, and receive confirmation. The process should capture the following activities:

E1 Search for Courses: The student searches for available courses. The system retrieves and displays a list of courses based on the search criteria. (2/14)

E2 Select Course: The student selects a course from the list. The system displays the course details. (2/14)

E3 Check Prerequisites: The system checks if the student meets the prerequisites for the selected course: (2/14)

- If prerequisites are met: The student can proceed to enrollment.
- If prerequisites are not met: The system notifies the student that they do not meet the prerequisites.

E4 Enroll in Course: The student enrolls in the course. The system processes the enrollment. (2/14)

E5 Confirm Enrollment: The system confirms the enrollment and sends a confirmation to the student. (2/14)

E6 Handle Payment: The system checks if the course requires payment. If the course requires payment, the student proceeds to the payment process: (2/14)

- If payment is successful: The system confirms the payment and finalizes the enrollment.
- If payment fails: The system notifies the student of the payment failure and allows them to retry.

E7 Finalize Enrollment: The system finalizes the enrollment and sends a confirmation to the student. (2/14)

Question F (12 marks)

Suppose you are designing a simple e-commerce website that allows users to browse products, add items to a cart, and make purchases.

F1 Explain what is modularity and why it is important to use it in designing the website. (6 /12)

F2 Taking the shopping cart and payment processing modules as the example, explain what is loose coupling and why is it beneficial in a modularized system. (4/12)

F3 Suggest one user interface design principle you would use to make the website easy to use and explain how it would improve the user experience. (2/12)

Question G (11 marks)

Do JUnit tests for the following program:

```
public class Calculator {

    public int add(int a, int b) {

        return a + b;

    }

    public int divide(int a, int b) {

        if (b == 0) {

            throw new ArithmeticException("Cannot divide by zero");

        }
```

```
        return a / b;
    }
}
```

G1 Write a test case for adding two negative numbers (3 /11)

G2 Write a test case for division by zero, with proper exception handling (4/11)

G3 Explain the purpose of the @BeforeEach and @AfterEach annotations in JUnit testing (4 /11).

Question H (12 marks)

You are managing a software development project to deliver a mobile banking application. As part of the project, you need to ensure the project is completed on time, within budget, and meets quality standards.

H1 Identify and describe two major risks that could affect the success of this project, one from a project risk perspective and one from a product risk perspective. (4/12)

H2 For each risk, propose a risk management strategy: one strategy to avoid or mitigate the project risk and one strategy to reduce the impact of the product risk. (4/12)

H3 Explain the importance of quality management systems in software engineering. (4/12)

The end of the paper