

CITS 4401/3301
Take home test #2
03 May 2023

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Instructions:

1. To be submitted as a single PDF or docx file by 04 May 2023, 4pm.
2. Please note this is an individual test. You can consult your notes but do not consult other students.
3. Provide your answers just below the questions in this file.
4. You can take as much space as required for your answers.
5. Do not change the order of your answers.
6. Use a black font for providing the answers.
7. You can use other colours for your diagrams if you wish to, but please make sure that the diagrams are readable.
8. There are ten points for following these instructions.
9. If I am not able to open your file then you will get zero points.
10. Make sure to submit the file.

Case study

In a small town in the “Utopian land”, there is a Townhall. The Townhall provides multiple services to the residents. They would like to automate some of the services including:

1) *management of the library*, 2) *a small cafeteria* (online orders can be made through an app) that they have inside the town hall, and 3) the *marriage register*.

Each new user in the system will be given a username and a password. The town hall consists of 10 employees. The library consists of about 3000 books.

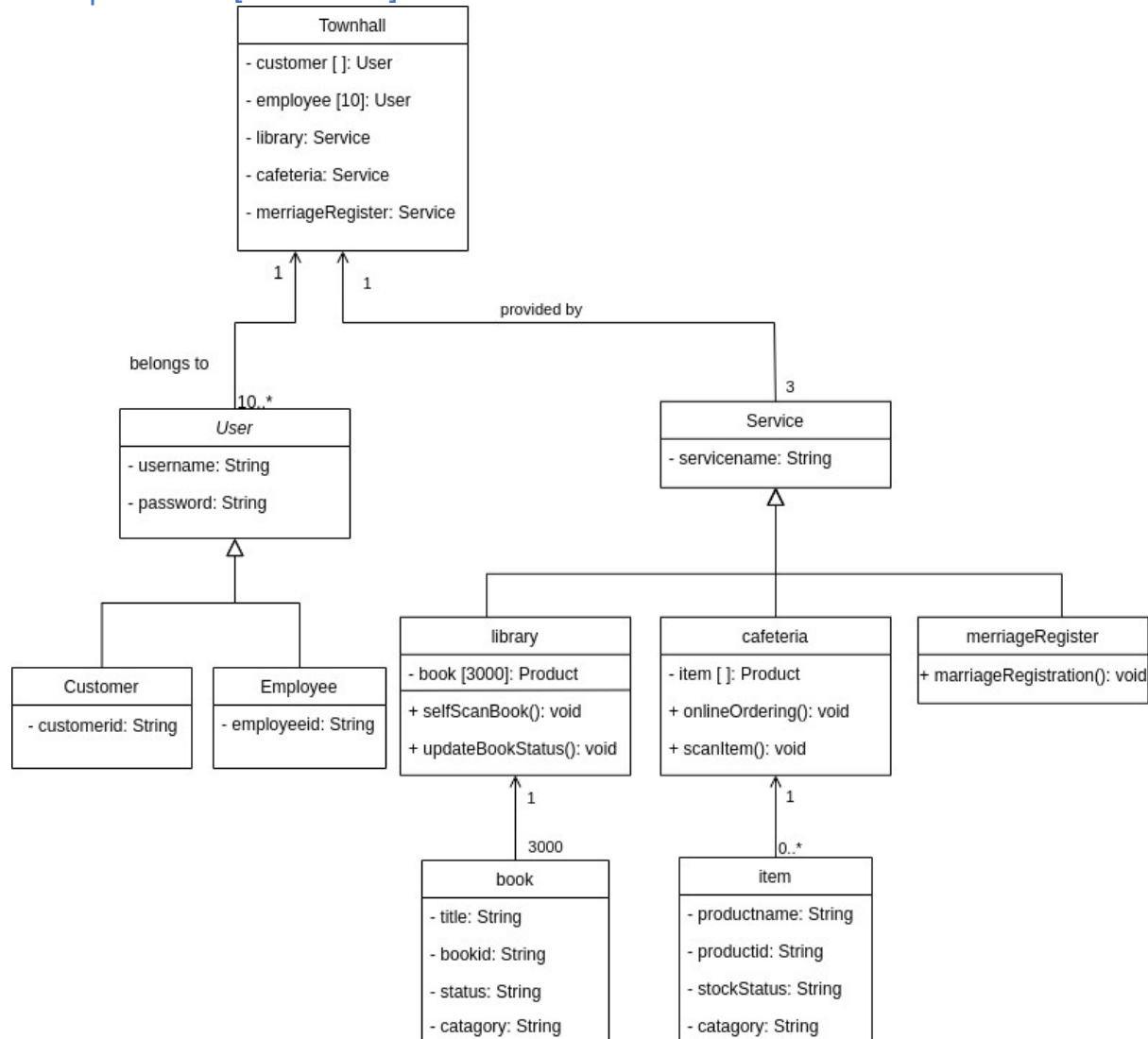
For getting a book, users can self-scan a book. Upon returning the book, the librarian will scan the book to update the system.

For the cafeteria, a small inventory of current items will be managed, which will be visible to users on the app. Once someone buys an item (either online or in-person), the cashier will scan the item, which will help update the inventory records.

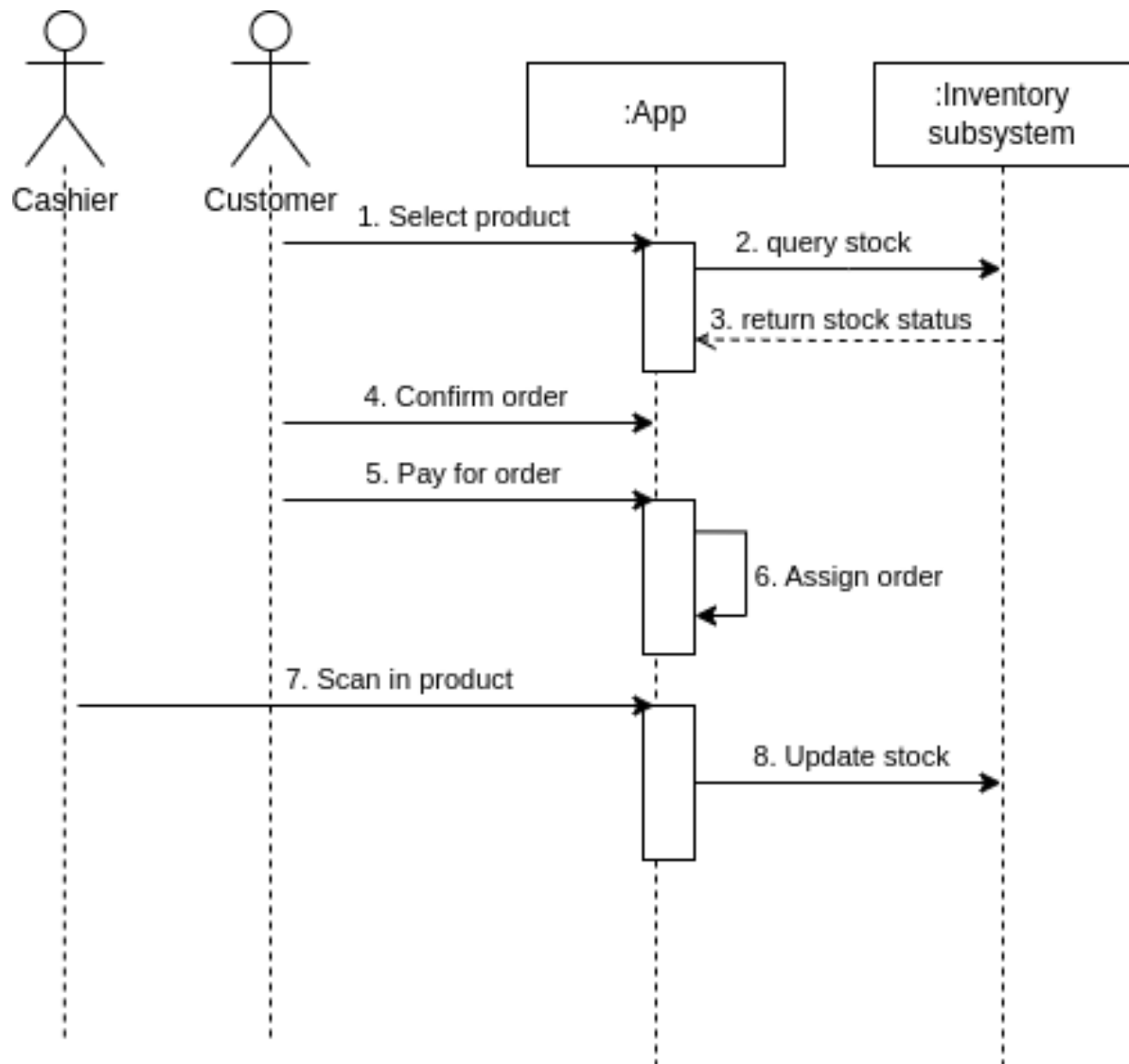
Please state your assumptions while attempting the questions

Questions (4 questions)

1. Design and draw a UML class diagram for the Townhall system. Include the main classes and their relationships for modelling the system. Maximum 6 classes. Only display the classes, associations and their multiplicities. [10 marks]



2. Draw a UML sequence diagram for the online process of ordering a sandwich. [10 marks]
:Inventory



3. A first step of system design is to clarify the requirements, and then break down the solution domain into subsystems. A subsystem is a collection of classes, associations, operations, events and constraints that are interrelated. [10 marks]

(1) Identify a list of subsystems for the Townhall system. Keep your subsystem decomposition simple and abstract at this stage. Make a list describing a maximum of 5 subsystems.

User Management Subsystem: This subsystem is used for managing user accounts, including user registration and login, as well as the modification of usernames, user profiles, and passwords. It also includes user type setting (customer or employee).

Library Management Subsystem: This subsystem is responsible for managing the library, including self-service book borrowing by customers, book return information updates by library staff, and inventory management. It also generates and sends book return reminders and assists with book retrieval.

Cafeteria Management Subsystem: This system is responsible for menu management, order placement, order fulfillment, and sales information management. It also handles payment information and customer feedback.

Inventory Management Subsystem: This subsystem is responsible for monitoring the inventory of both the library and the cafeteria, to track inventory levels and reorder points for restocking.

Marriage Register Management Subsystem: This subsystem is used for managing marriage registrations, including the issuance of marriage licenses, scheduling of marriage ceremonies, and the archiving and retrieval of records of relevant personnel.

(2) What is the coupling between your subsystems? Is the level of coupling and cohesion in your system high or low? Explain your answer.

Overall, the degree of coupling between these subsystems appears to be relatively low, with most of the coupling being data coupling.

The User Management Subsystem has low coupling with the other subsystems, as it only provides user authentication for accessing the other subsystems.

The Library Management Subsystem has some data coupling with the Inventory Management Subsystem, but only for inventory management.

The Cafeteria Management Subsystem has some data coupling with the Inventory Management Subsystem, but only for inventory management.

The Inventory Management Subsystem has data coupling with both the Library and Cafeteria Management Subsystems, but only for inventory management.

The Marriage Register Management Subsystem has low coupling with the other subsystems, as it only interacts with the User Management Subsystem for user account data.

These subsystems are all high in cohesion levels, because they only manages all aspects of their specific area with minimal help from other subsystem (mostly data coupling).

4. Select one of your chosen subsystems and identify 2 contrasting designs for implementing that subsystem. Use design rationale to document the best design decision considering these 2 options. Your answer should clearly identify: Issue, Proposals (your two design ideas), Criteria, Arguments and Resolution. Also mention any unresolved questions or assumptions you identify.

[10 marks]

Issue: The Library Management subsystem needs to implement a book reservation feature that allows users to reserve books that are currently not available in the library because they are borrowed by other users.

Proposals:

1. Implementing a simple book reservation system that allows users to place a hold on checked-out books and receive email notifications when the book becomes available.
2. Implementing a more complex book reservation system that allows users to choose from multiple book formats and specify a preferred pickup location for the reserved book.

Criteria:

User experience: The reservation system should be easy to use and understand for library users.

Implementation complexity: The reservation system should be feasible to implement given the resources and time available.

Scalability: The reservation system should be able to handle increasing numbers of reservations as the library collection grows.

Cost effectency: The reservation system should be cost-effective to implement and maintain.

Arguments:

Proposal 1 is a simpler solution that can be implemented quickly and easily, and it meets the basic needs of library users who want to reserve a book.

Proposal 2 offers more options to library users but may require more development time and resources to implement. It may provide a better user experience for library users who want more control over the reservation process.

Resolution:

After considering the criteria and arguments, Proposal 1 is the better choice for implementing the book reservation feature in the Library Management Subsystem. Proposal 1 meets the basic needs of users without adding too much complexity to the system. It can be implemented quickly and inexpensively, while still providing a valuable feature for library users. Proposal 2 is not the optimal solution, as it may be too complex and costly to implement at this time.

Unresolved questions or assumptions:

It is assumed that the email notification system for Proposal 1 is a reliable and effective means of notifying users of available books. If this is not the case, alternative notification systems may need to be considered, such as Facebook or Instagram message notifications.

Appropriate market research may be necessary to understand user expectations for the system's functional design and the potential non-functional requirements of the library.