CITS 4401/3301

Take home test #2

03 May 2023

Student Name:

Student Number:

**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]

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.

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

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]