Programme Code: DT228/TU856
Module Code: CMPU 2020
CRN: 22394

TECHNOLOGICAL UNIVERSITY DUBLIN

GRANGEGORMAN CAMPUS

DT228 - BSc. (Honours) Degree in Computer Science

Year 2

SEMESTER 2 EXAMINATIONS 2021/2022

Software Engineering 2

Internal Examiners
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External Examiner
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Instructions

Attempt four out of five questions
All questions carry equal marks

Two hour exam

1. (a) Briefly describe and distinguish between the following types of software testing:

- unit
- integration
- functional.

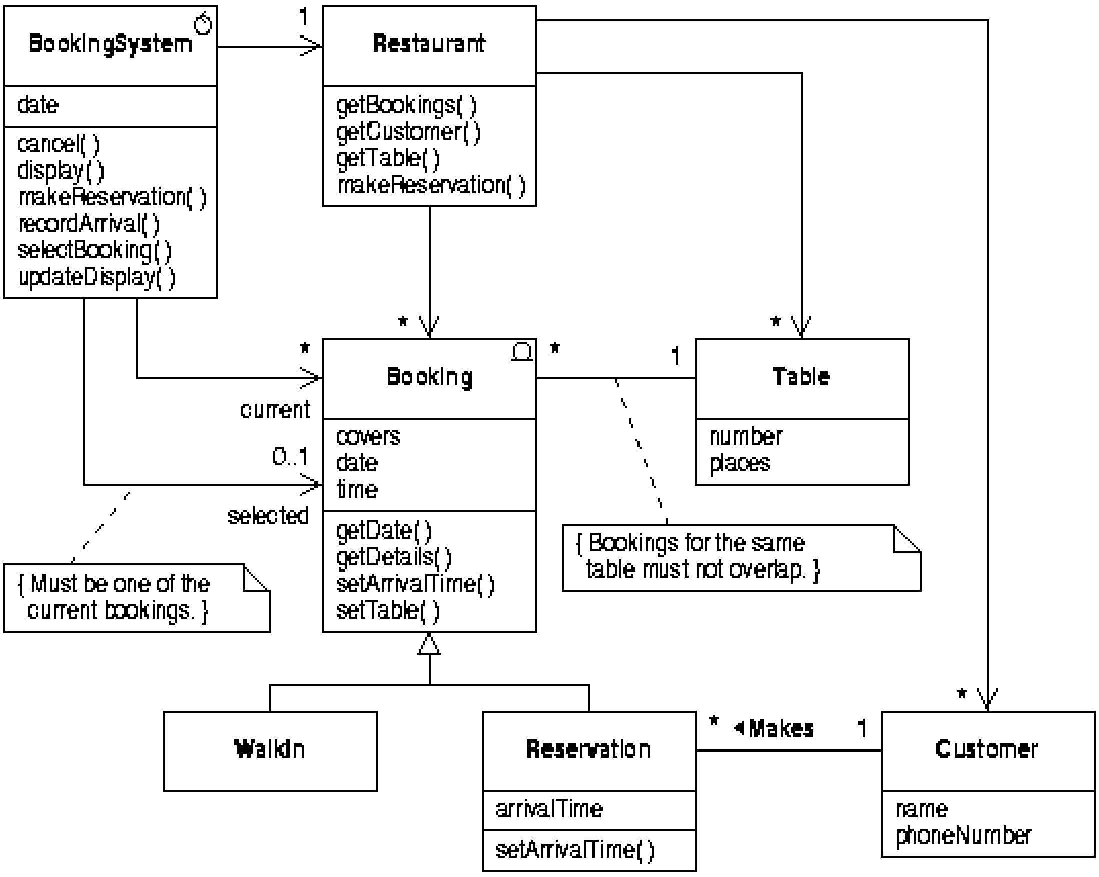
In your answer make reference to white-box and black-box testing and mention who is responsible for writing the different levels of tests in a software development project

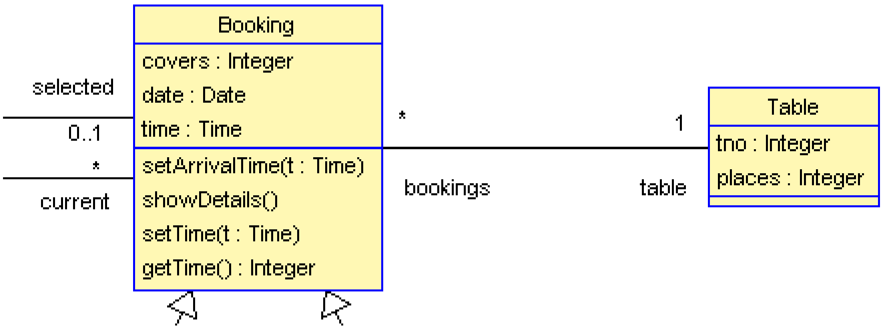
(15 marks)

(b) Describe the Adapter design pattern and distinguish between the class adapter and object adapter approaches.

(10 marks)

2 **(a)** Draw a statemachine for the BookingSystem control class for the partial restaurant domain models shown below. Write the operation appropriate for each state transition and an appropriate guard condition for recordArrival() which states that the table capacity must be greater than or equal to the number of people in the booking.





(8 marks)

(b) Draw sequence diagrams for the use-cases display() and recordArrival(). Is recordArrival() linked with or dependent on any other use-cases?

(10 marks)

(c) Provide an OCL version of the two constraints shown above.

(7 marks)

3. You are required to do some object-oriented design for a standalone restaurant software system that mainly manages bookings. The restaurant software should be able to handle advance reservations, walk-in bookings, assigning tables to reservations and so on.

(a) A layered architecture allows for separation of concerns. Explain what is meant by this. Then describe an appropriate layered architecture for the restaurant system given that it will be implemented as standalone software.

(5 marks)

(b) In light of your architecture from part (a), suggest an appropriate design which would allow for persistency/storage concerns without compromising the cohesion of the application classes. Comment on the reasons for your design choices.

(10 marks)

(c) In the mapper Java classes a Hashtable may be used as in:

```
public class CustomerMapper
{
    private Hashtable cache ;
    …
    …
}
```

For this class, outline the steps involved when the operation **getCustomer(String n, String p)** is called and in particular how it interacts with the Hashtable and why. Code is not required.

Mention any design pattern implicit in this class and provide the corresponding code fragment.

(10 marks)

4. (a) Explain what is meant by *Design by Contract* (DbC). Elaborate on how a contract is affected by subclassing/polymorphism.

(9 marks)

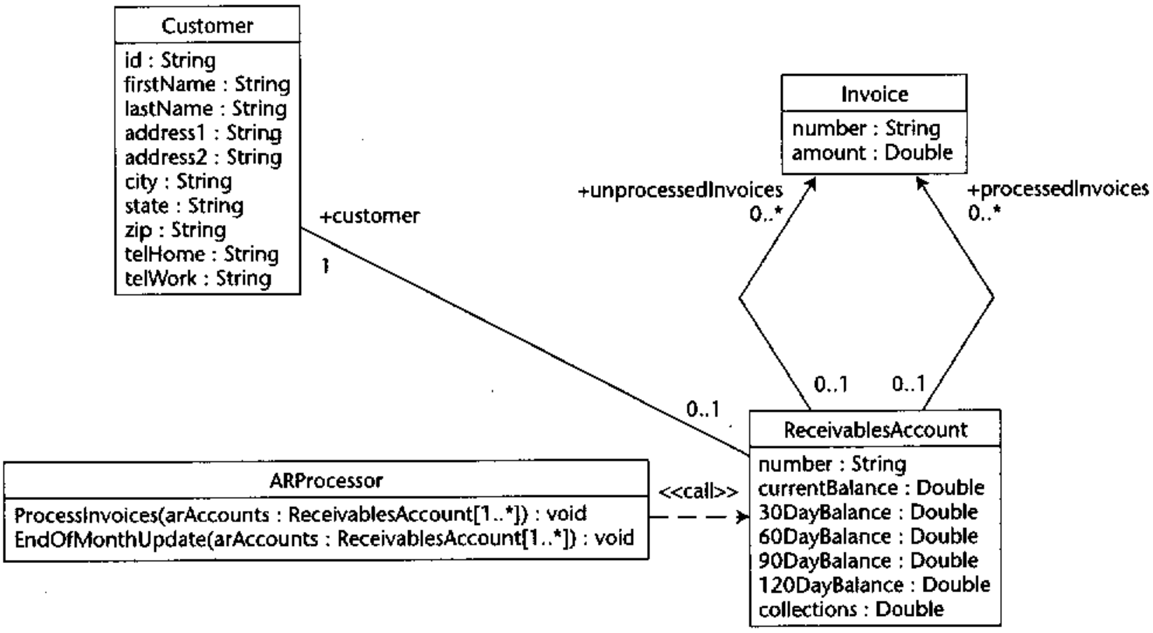
(b) Within the context of DbC, comment on benefits and obligations for both client code and provider code. Mention when exceptions might be appropriate.

(6 marks)

(c) Given the class diagram below, write an *Object Constraint Language* (OCL) contract invariant for *ReceivablesAccount* which states that no invoice can be in both *processedInvoices* and *unprocessedInvoices* collections at the same time.

Write an OCL contract that you deem appropriate to express the business logic *ProcessInvoices()* operation of the class *ARProcessor*.

(10 marks)



5. (a) Describe six of the key practices of the agile methodology XP.

(12 marks)

(b) Discuss the diagram below from the point of view: Anticipatory Design versus Refactoring.

(13 marks)

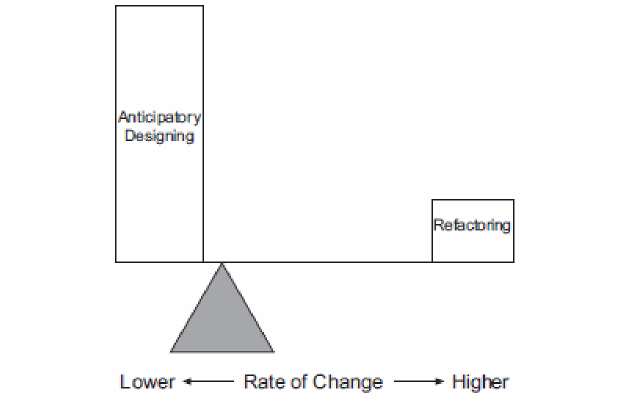


Figure 3 — Balancing design and refactoring, pre-internet.

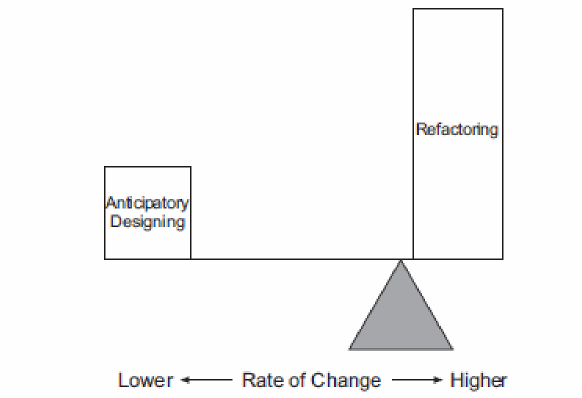


Figure 4 — Balancing design and refactoring today.