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SEMESTER 1 EXAMINATIONS 2020/2021

MODULE: CA314 - OO Analysis and Design

PROGRAMME(S):
CASE BSc in Computer Applications (Soft.Eng.)
ECSAO Study Abroad (Engineering & Computing)

YEAR OF STUDY: 3,O

EXAMINER(S): Renaat Verbruggen ext. 5257

TIME ALLOWED: 2 Hours

INSTRUCTIONS: **Answer all questions. All questions carry equal marks.**

PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.
The use of programmable or text storing calculators is expressly forbidden.

There are no additional requirements for this paper.

QUESTION 1 ***[TOTAL MARKS: 20]***

Q 1(a) **[16 Marks]**

The "SOLID" design principles aim to guide the improved development of object-oriented systems. Explain FOUR of these principles using simple code examples in each case. You may not use C#.

Q 1(b) **[4 Marks]**

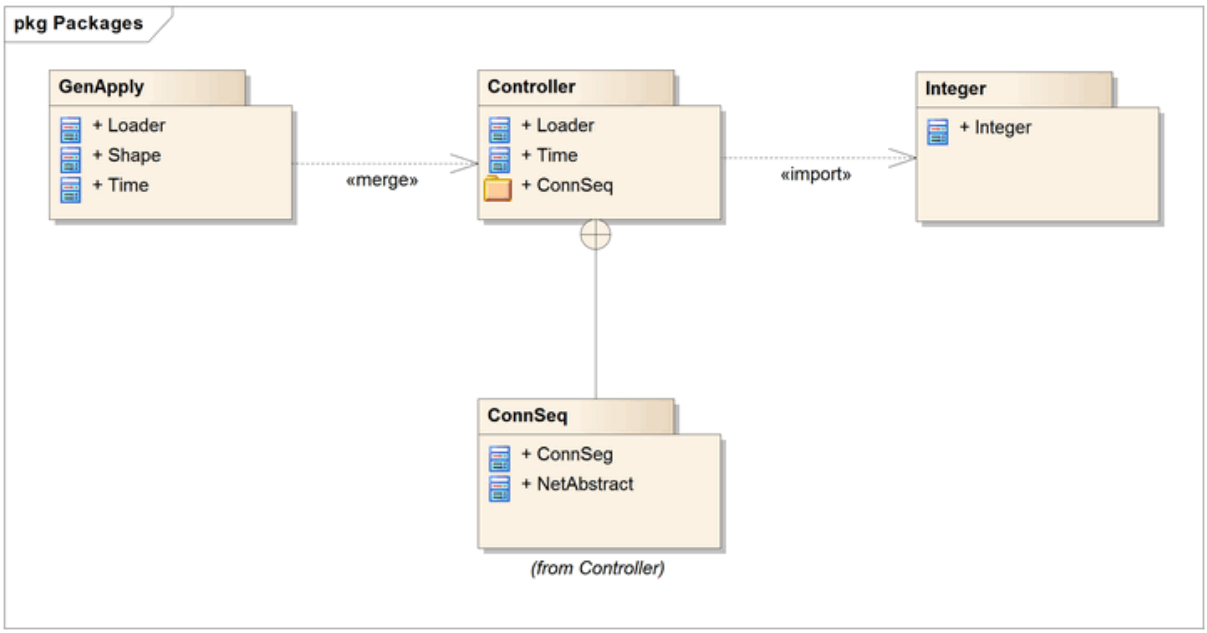
Explain how code factorisation can be used to enforce these four principles.

[End of Question 1]

QUESTION 2 ***[TOTAL MARKS: 20]***

Q 2(a) **[12 Marks]**

Explain the elements of the following Package diagram.



Q 2(b) **[6 Marks]**

Explain how packages enforce scope and visibility of names from a UML viewpoint and give short examples.

Q 2(c) **[2 Marks]**

Should interfaces appear on a Package diagram? If not, why not?

[End of Question 2]

QUESTION 3 ***[TOTAL MARKS: 20]***

Q 3(a) **[10 Marks]**

Draw a UML state diagram for the Object **Reservation** corresponding to the description in the Appendix.

Q 3(b) **[5 Marks]**

Explain how super and sub states and concurrency are shown on State Diagrams, give examples.

Q 3(c) **[5 Marks]**

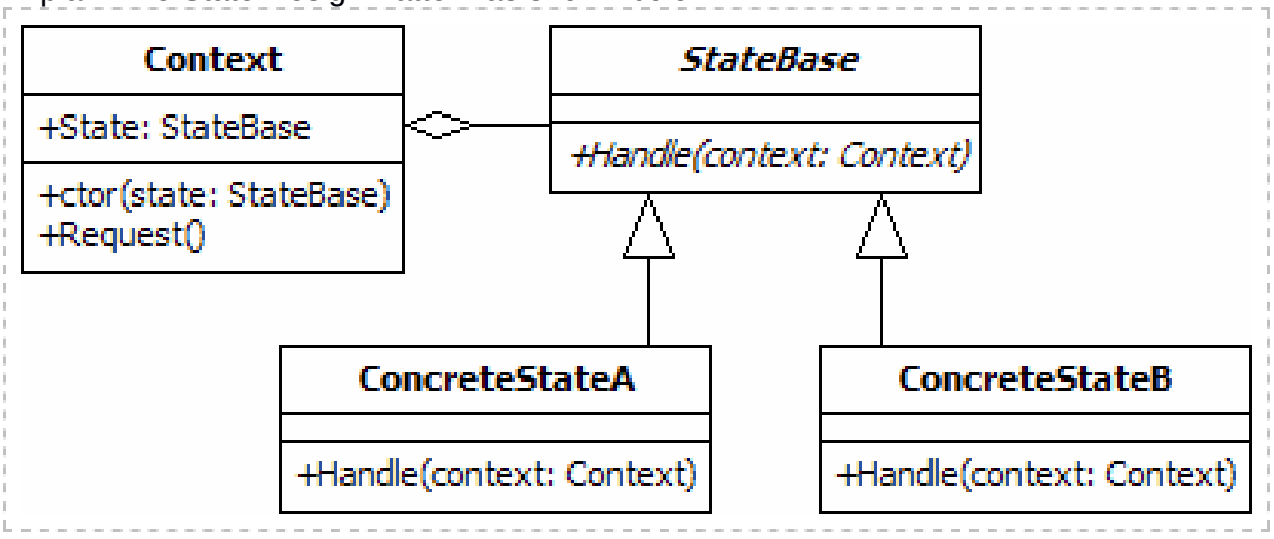
Draw a Class Diagram to represent the important classes of the Hire Company of the Appendix. Make sure that you label the elements of the diagram well.

[End of Question 3]

QUESTION 4 **[TOTAL MARKS: 20]**

Q 4(a) **[10 Marks]**

Explain The State Design Pattern as shown below:



Q 4(b) **[5 Marks]**

Describe how this Pattern could have been used in your Game project.

Q 4(c) **[5 Marks]**
Explain another Design Pattern that you could have used in your project. Use diagrams and/or code snippets to illustrate the Pattern.

[End of Question 4]

QUESTION 5 **[TOTAL MARKS: 20]**

Q 5(a) **[8 Marks]**
Write a report on the group project carried out by your team for module CA314. Your report should include a precise, specific summary of the main activities and deliverables that made up your team's project. Use diagrams as appropriate.

Q 5(b) **[3 Marks]**
Indicate which Object-Oriented diagrams and methods were of most benefit during your development.

Q 5(c) **[3 Marks]**
Highlight those aspects of the project that you found especially difficult or challenging. Explain why.

Q 5(d) **[6 Marks]**
Based on your experience of the project, outline a development framework for a family of internet-based board games. This should include, but not necessarily be limited to, identification of features common to the games in the family, and presentation of an abstract class model for the framework.

[End of Question 5]

Appendix

A software system has been developed to support the operations of a specialised car-hire company. One software class within the system is called **Reservation** and the lifecycle of a **Reservation** object is described as follows [*from O'Docherty, Object-Oriented Analysis & Design, Wiley*]
"When a Member reserves a CarModel over the Internet, the **Reservation** is initially Waiting to be processed by an Assistant (this is so the Customer can make a **Reservation** without the intervention of an Assistant). The **Reservation** becomes Notifiable if, some time later, an Assistant finds a suitable unreserved Car in the display area of the car park, or if one is returned by a Customer. In this case, the Car is moved to the reserved area.

If no car becomes available for a particular **Reservation** within a week, the **Reservation** becomes NeedingRenewal: the Member must be contacted, by phone or in person, so that they can cancel the **Reservation**, or ask for it to be renewed for another week. If the Member cancels or can't be contacted within five days, the **Reservation** is concluded.

Once a **Reservation** is Notifiable, the Member must be notified by an Assistant, in person or by phone, within three days; if the Customer can be reached, the **Reservation** is Collectable otherwise it becomes Displayable (a Car that was moved to the reserved area must be returned to the display area).
Once a **Reservation** is Collectable, the Member must collect the Car within three days; if they do collect, the **Reservation** is Concluded; otherwise, the **Reservation** becomes Displayable.
Once a Displayable reservation's Car has been put back in the display area, the **Reservation** is Concluded.
At any time, the Member may cancel the **Reservation** over the Internet, by phone or in person."

[END OF APPENDIX]

[END OF EXAM]