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SEMESTER 1 EXAMINATIONS 2022/2023

MODULE: CA314 - OO Analysis and Design

PROGRAMME(S):
CASE BSc in Computer Applications (Soft.Eng.)

YEAR OF STUDY: 3

EXAMINER(S):
Renaat Verbruggen (Internal) (Ext:5257)

TIME ALLOWED: 2 Hours

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

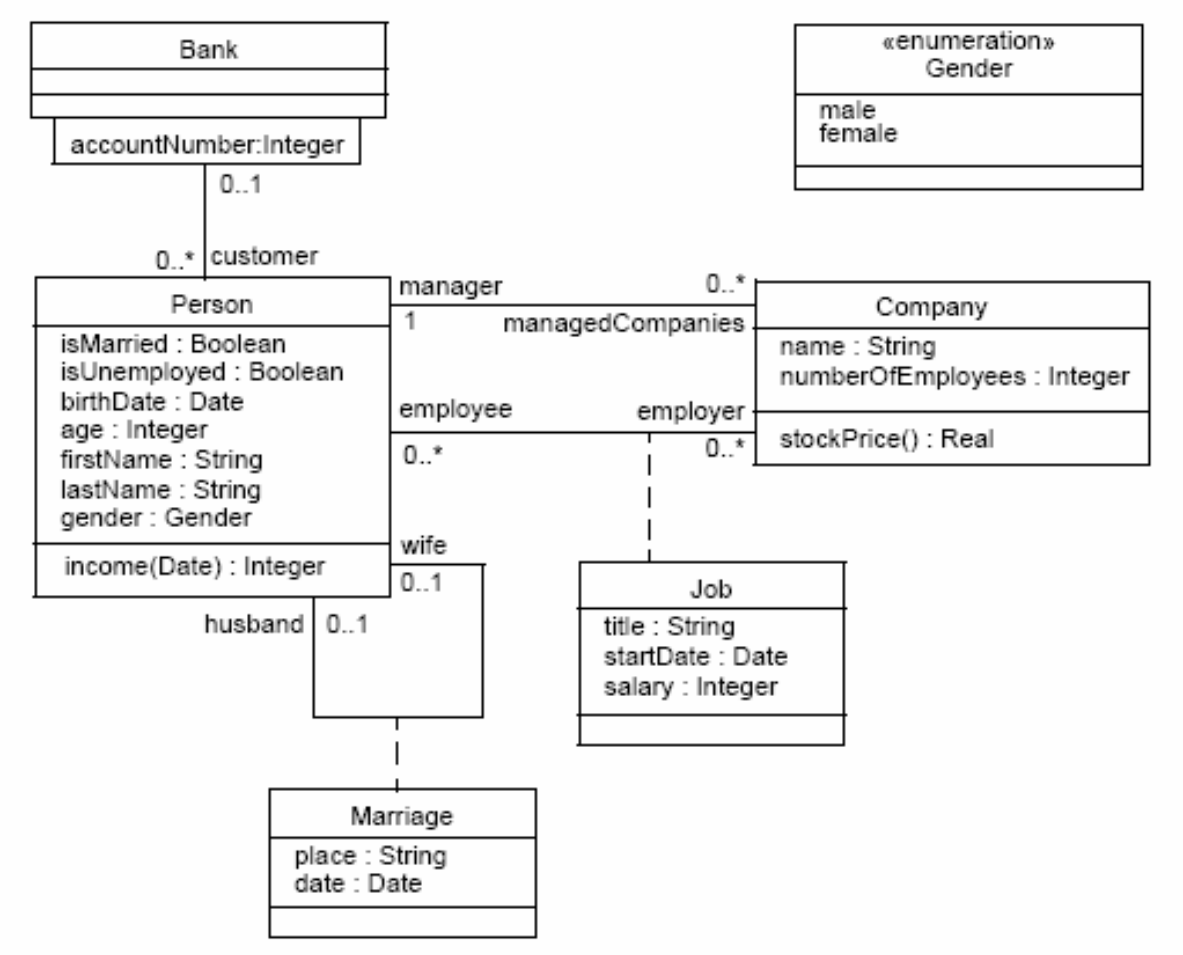
PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.
The use of programmable or text storing calculators is expressly forbidden.
Please note that where a candidate answers more than the required number of questions, the examiner will mark all questions attempted and then select the highest scoring ones.

There are no additional requirements for this paper.

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

Q 1(a) **[10 Marks]**

Explain all of the syntactical elements of the following class diagram.



Q 1(b) **[10 Marks]**

Draw a Sequence Diagram using the above Classes to model the Use Case: *Resign from the Company*. Utilise the main features of UML Sequence Diagrams including highlighting when an object is computing, depiction of time constraints, return of values, creation and deletion of objects, representation of conditional behaviour and of iteration, and modelling of several threads of control.

[End of Question 1]

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

Q 2(a) **[10 Marks]**

The SOLID principles emphasise good software design practice. Pick three of these principles and explain their purpose and advantage.

Q 2(b) **[10 Marks]**

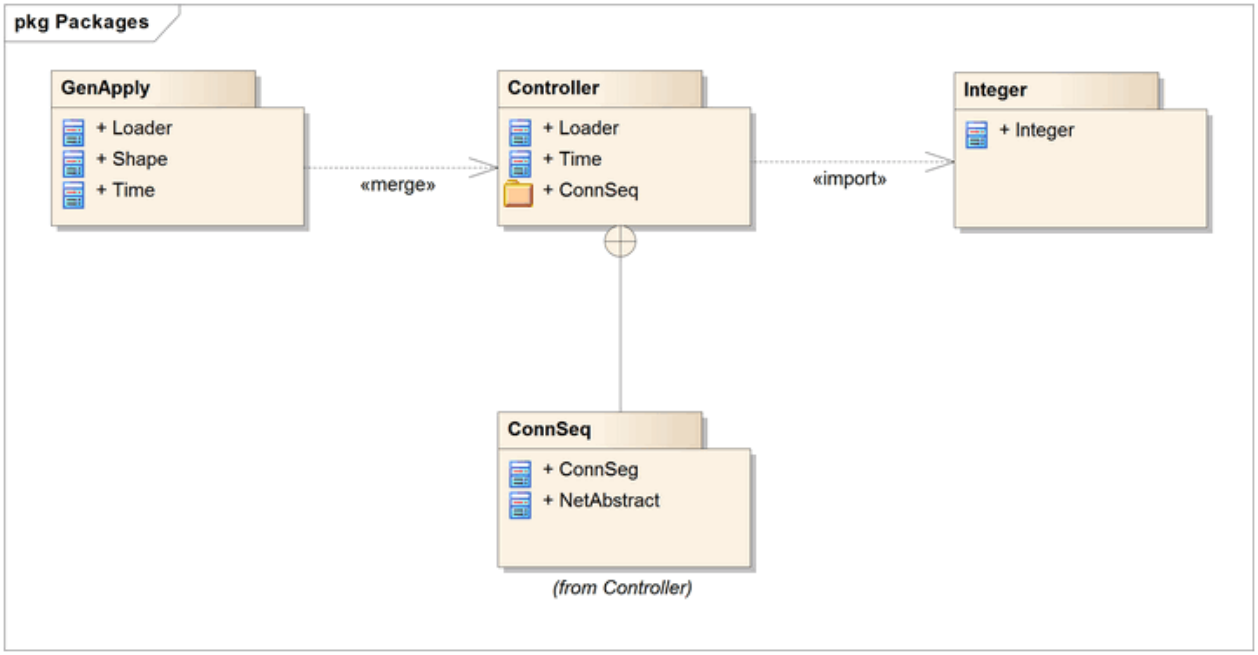
Take each of the principles that you have chosen in **1(a)** and give short software examples to illustrate them.

[End of Question 2]

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

Q 3(a) **[12 Marks]**

Describe the purpose of each of the elements in the following Package diagram.



Q 3(b) **[8 Marks]**

Explain how packages enforce scope and visibility of names from a UML viewpoint. You can use the diagram in **1(a)** for illustration.

[End of Question 3]

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

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

Draw a UML state diagram for the Object **Reservation** corresponding to the description in the Appendix. Use as many elements of the diagram as necessary including, guards, events and actions.

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

Show how super and sub-states and parallelism are indicated on State Diagrams.

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

When are state diagrams best used and explain what are history states and the use of entry and exit points?

[End of Question 4]

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

Q 5(a) **[7 Marks]**

Explain what Design Patterns *are* and *are not* and what the typical headings should be for their description.

Q 5(b) **[7 Marks]**

Show with an example such as an Order, how Components can have both required and provided interfaces. And explain the benefit of their use.

Q 5(c) **[6 Marks]**

Show with examples how Packages provide Name-Space visibility. Use Public, Private, Protected and Package (default) to illustrate your answer

[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.

"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 cannot 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]