Family Name: _____ (That the university has for you in its records)

Other Names: _____

Student Number: _____ Section: _____ **(A OR B)**

Université d'Ottawa
Faculté de génie

School of Information
Technology and Engineering

uOttawa
L'Université canadienne
Canada's university

University of Ottawa
Faculty of Engineering

École d'ingénierie et de
technologie de l'information

SEG 2105
Introduction to Software Engineering

MIDTERM – Saturday, October 24, 2015 – 9:00 FSS 2005

Time Allowed for Examination: 90 Minutes

Professor: Miguel A. Garzón

Open book. (You may use textbook, personal notes etc., but no electronic devices). If you don't understand a question, state an assumption.

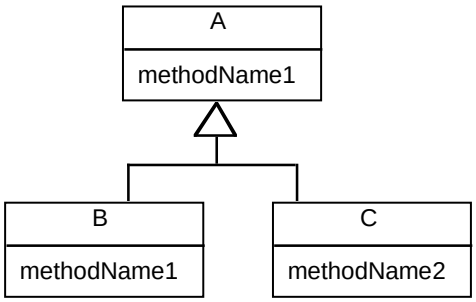
Good luck!

TOTAL _____ / 90

Name _____

PART 1 (40 marks)
Questions 1-20 are multiple choice and are worth 2 marks each (total of 40 marks). **Circle the single best answer**. As you are working, put a question mark by the questions you think you are least sure about/

1. Given the following class diagram, in which of the following cases would **dynamic binding** be needed. Assume that the compiler knows that no additional subclasses can be created of any class, nor can any extra methods be added.



a) Operation **methodName2** is invoked on a variable of type **A**
b) Operation **methodName1** is invoked on a variable of type **A**
c) Operation **methodName1** is invoked on a variable of type **B**
d) Operation **methodName1** is invoked on a variable of type **C**
e) More than one of the above

2. In the diagram of question 1, which of the following should result in a compiler error
a) Operation **methodName2** is invoked on a variable of type **A**
b) Operation **methodName2** is invoked on a variable of type **C**
c) Operation **methodName1** is invoked on a variable of type **B**
d) Operation **methodName1** is invoked on a variable of type **C**
e) More than one of the above

3. Which of the following is true of a composition?
a) It represents a part-whole relationship
b) The part(s) must be destroyed when the whole is destroyed
c) The whole must be destroyed when the part(s) are destroyed
d) All of the above
e) Two of the above

4. Which aspect of quality would be most improved by the decision to create a **framework** when developing a software system?
a) Usability
b) Efficiency
c) Reliability
d) Maintainability
e) Reusability

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5. In SimpleChat, what is the purpose of ChatIF?
   a) It allows flexibility to communicate with a different server without changing the ChatClient code
   b) It is where the code for the user interface can be found
   c) It is abstract class allowing you to have several concrete UI classes
   d) It allows flexibility to change the UI class without changing the ChatClient code
   e) None of the above

6. Which of the following is **not** a special kind of *association* that may appear in a class diagram?
   a) Aggregation
   b) Composition
   c) Unidirectional
   d) Generalization
   e) Reflexive

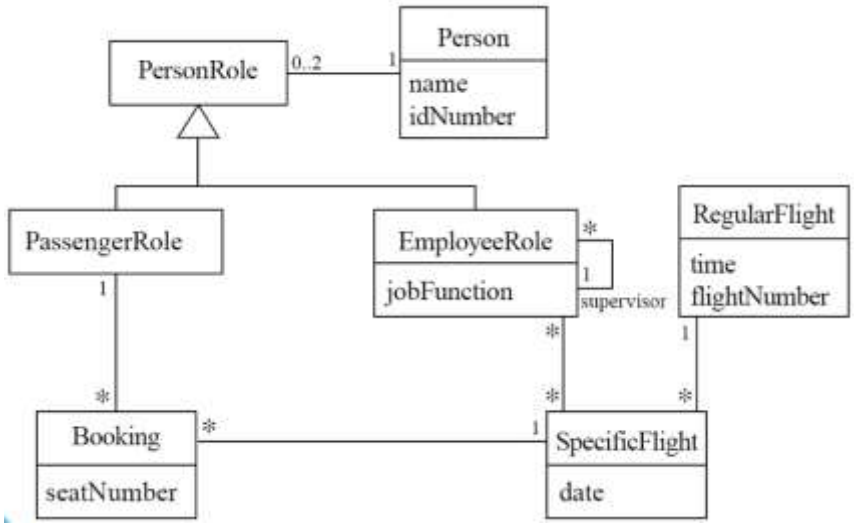
7. Which statement better describes **extensions** among uses cases?
   a) They allow you to capture commonality between several different uses cases
   b) They describe aspects of what the system must do
   c) They are constraints that must hold for the related used cases
   d) They are used to make optional interactions explicit or to handle exceptional cases
   e) None of the above

8. Which of these requirement categories better describe the following requirement statement:
   '*The java.util.Date class should be used to handle dates*'
   a) Functional
   b) Platform
   c) Quality
   d) Process
   e) Not a requirement

9. Which of these requirement categories better describe the following requirement statement:
   '*The system shall be able to process 20 registrations per hour in peak load'*
   a) Functional
   b) Platform
   c) Quality
   d) Process
   e) Not a requirement

Name _____

Questions 10-11 relate to this diagram



10. Imagine I want to add a class AirplaneType, which includes a description (e.g. Boeing 767) and number of seats. Which of the following would be the Umple code that would most sensibly add this class. Assume that the type of airplane is known long before the actual airplane to be used is assigned to a given day's flight.
    a) class AirplaneType {description; Integer numSeats; 1--* RegularFlight;]
    b) class AirplaneType {description; numSeats: Integer; 1--* RegularFlight;]
    c) class AirplaneType {description; Integer numSeats; *--1 RegularFlight;]
    d) class AirplaneType {description; numSeats: Integer; *--1 RegularFlight;]
    e) class AirplaneType {description; Integer numSeats; 1--* SpecificFlight;]

11. Which if the following is **false**?
    a) PassengerRole inherits the association to Person
    b) Booking inherits the association to Person
    c) We can always determine the unique name of any EmployeeRole
    d) People who are employees cannot be given passenger seats on the plane
    e) More than one of the above

12. Which of the following is **true** about **asymmetric** reflexive associations?
    a) They have to be unidirectional
    b) They have to be labeled using different role names
    c) They have to be labeled using association names
    d) They connect a class to its super class
    e) They represent a mutually exclusive relationship between classes

13. Which of the following statements is **false** in the context of object (instance) diagrams?
    a) Generalizations describe a relationship between instances at run-time
    b) An object diagram can only contain links generated by associations
    c) The number of links among instances are consistent with the multiplicity of the class diagram
    d) A class diagram can generate an infinite number of object diagrams
    e) An object diagram shows a configuration of objects and links that exist at run-time

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14. Which of the following is true of a **composition**?
    a) It represents a part-whole relationship
    b) The part(s) must be destroyed when the whole is destroyed
    c) The whole must be destroyed when the part(s) are destroyed
    d) All of the above
    e) Two of the above

Questions 15 to 18 are based on the following diagram:

15. In the above diagram, what should the **multiplicities** between the two classes be?
    a) 0..1 to 0..1
    b) * to 1
    c) * to *
    d) 1..* to 1
    e) 1 to 1..*

16. If I wanted to add the ability to indicate that a movie can have a **sequel**, what would be the best way to do it?
    a) Create a class Sequel with an association to Movie
    b) Create a symmetric reflexive association on Movie
    c) Create an asymmetric reflexive association on Movie
    d) Create another association between Movie and Actor
    e) Create a symmetric reflexive association on Actor

17. For your answer to question 16, what would the **most reasonable multiplicities** be?
    a) 1 to *
    b) * to 1
    c) * to 1..*
    d) 1..* to 1
    e) 1 to 1..*

18. In your answer to question 17, which of the following would be a **role name**
    a) A label ‘sequel’ placed in the middle of an association line
    b) A label ‘sequel’ placed in the class box, just below the name of the class
    c) A label ‘isSequelOf’ placed in the middle of an association line
    d) A label ‘isSequelOf’ placed at the end of an association line
    e) A label ‘sequel’ placed at the end of an association line

19. Domain analysis should be started:
    a) Prior to starting to develop requirements
    b) After developing requirements, but before completing the design
    c) After doing the design, but before coding
    d) After testing
    e) After releasing the finished system to the domain expert

Name _____

20. Imagine you have a system with a class diagram corresponding to the following Umple code:

```
class User {name;}
class Book {title; author;}
class Copy {barcode; * -- 1 Book;}
class Loan {Date dueDate; * -- 1 User borrower; * -- 1 Copy borrowedItem;}
```

Class *Loan* is a:

a) An symmetric reflexive association
b) An association class
c) A reflexive association
d) An abstract class
e) None of the above

REMEMBER TO COPY YOUR ANSWERS TO YOUR SCANTRON SHEET

Name _____

PART 2 (50 marks)

A. **Create a UML class diagram for system described below.**
Please include appropriate classes, their attributes (including types), and associations (with directions, multiplicities, compositions, and role names). No need to describe the operations or visibility (-, +, #) of attributes/roles.

Marks will be given for effort, even if you don't have a perfect solution. However, marks will be lost for the common types of mistakes. Please do not include operations.

Problem description: a **Soccer League Management System**

You must model the domain of a **soccer league management system** where we want to represent at least the following concepts:

1. There are many types of people involved: players, coaches, and referees.
2. Players and coaches belong to only one team.
3. Each team in the league has at least 18 players (including two goalkeepers), and 1 to 3 coaches.
4. Each game between two teams is refereed by 3 referees.
5. All people have a name, a date of birth, a city of origin, and a unique identifier. Players also have a jersey number.
6. A season includes 24 games per team. The dates and locations of each game are determined in advance.
7. As we would like to calculate some statistics during the season (including the ranking!), we must be able to determine for each game: the final score, who scored the goals, and which goalkeepers have been scored goals.
8. Players can also get, during a game, yellow and red cards. After a red card or two yellow cards in a game, a player must skip the next game.
9. Assumption: players and coaches will not change during the season. During a game however, the players on the field (including goalkeepers) can obviously change!

Name _____

UML Class diagram for the Soccer League Management System
(answer here)

Name _____

B. Write the following OCL constraints (specify the context of the constraint) for your model.

1. The Jersey number of a Player must be greater than 0. (1.5 points)

2. No teams named '*Barcelona'* can be created in the system. (1.5 points)

C. Write 1 (**one)** functional requirements and 1 (**one)** non-functional requirement for the Soccer League Management System. (4 points)

_____

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D. Specify **one** possible use case for the **Player** and **Administrator** actors in the Soccer League Management System. Assume that this system will be used by a soccer league organizer (FootySevens for instance) to manage their soccer leagues. **You only need to provide the name of the use case.** (3 points)

Example. The **Referee** actor participates in the use case: "**Enter results of a game**".

Player

_____

Administrator

_____