INSTITUTE OF TECHNOLOGY CARLOW

No: ???A

SCHOOL OF SCIENCE

DEPARTMENT OF COMPUTING AND NETWORKING

AUTUMN EXAMINATIONS 2011

COURSE CODE: CW131-2 **DATE: ?**
TIME: ?

Course Title: Bachelor of Science (Honours) in Computer Games Development

Course Year: 2

Subject: **Software Engineering for Games I**

Duration: **3 Hours**

Examiners: **Dr C Meudec**
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SPECIAL REQUIREMENTS:

INSTRUCTIONS TO CANDIDATE:

1. **Write your Name, Course, Course Year and Class Group on your answer book;**
2. **Marks as indicated in brackets;**
3. **Answer Question 1 and two other Questions.**

Question 1 {Compulsory} [50 Marks]

Latest news:

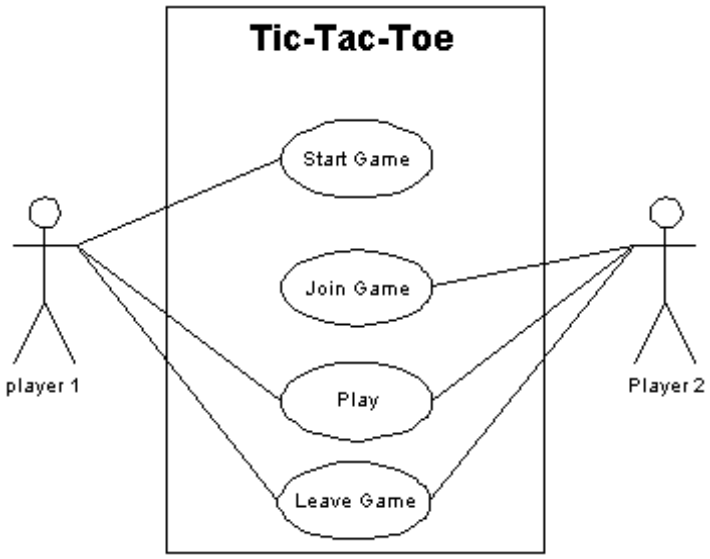
> *A new Irish start-up company wants to enter the computer game market, but since their initial budget falls well short of what would be required, they have decided to limit themselves initially to web games using Java Applets. One kind of game that the company would like to develop are board games. In order to ease the development of new board games (and hopefully move to other platforms), it is hoped that a framework suitable to most board games can be developed and later adapted to many board-based games*

Your boss says:

> *Hi! To help with the development of the general framework, Tic-Tac-Toe (also known as Noughts and Crosses), which is board-based, will be developed first and be used as a framework in future board game development. It is therefore important that the underlying UML models of this first game be of very good quality and be as general as possible even if for the Tic-Tac-Toe example it may seem a bit of an overkill. Find the initial specification below.*

The game is played on a 3 by 3 square board between two players. The player who starts chooses a square on the board and puts a cross on it. The other player chooses an empty square and puts a nought on it. Thereafter the players continue to alternate placing their own marks in empty squares. The winner is the first player to complete a straight line (horizontal, vertical or diagonal) of three of their own tokens. If the board is filled without either player achieving this, the game is a draw.

> *Got that? OK, Good. We want an application that allows two human players to play over the web via separate web-based GUIs which also need to be developed. Don't worry about HTML, Networks and Java yet: we need an analysis and a design that are very Object Oriented to show case our skills. Also you can assume that there is only one game going on at any one time. You must follow the high level use cases and use case diagram that I have written:*



- *Start Game*
  - *Actor : Player 1*
  - *Type : Primary*
  - *This use case begins whenever a player starts a new game and inputs his/her name.*
- *Join Game*
  - *Actor : Player 2*
  - *Type : Primary*
  - *This use case begins whenever a player joins the game and inputs his/her name(must be different than Player 1's).*
- *Play*
  - *Actor : Player 1 and Player 2*
  - *Type : Primary*
  - *This use case begins wherever a player, whose turns it is to play, makes a move by choosing a free square.*
- *Leave Game*
  - *Actor : any Player*
  - *Type : Primary*
  - *This use case begins whenever a player leaves an unfinished game.*

Of course, you have to follow our company way of doing things.
Please find this detailed below.

If you feel that there are problems with the description of the system above, resolve them yourself by stating assumptions in your answers.
Taking into account your boss' remarks complete the following tasks.

a) [10 Marks]
Re-write all use cases in a fully detailed format.

b) [10 Marks]
Draw a suitable UML domain model.

c) [5 Marks]
Draw the necessary UML system sequence diagrams for all use cases.

d) [10 Marks]
Write the contracts for the system operations you have identified.

e) [10 Marks]
Draw the necessary UML interaction diagrams (without worrying about the preconditions that you have identified in your contracts).

f) [5 Marks]
Draw the UML design class diagram.

Question 2 [25 Marks]

a) [5 Marks]
For a software development project, discuss why a Suplementary Specification document is necessary over and above a Use Case Model.

b) [5 Marks]
Within the confines of the Unified Process, what guidelines would you issue to your team regarding the scheduling of use cases?

c) [10 Marks]
What is meant by an 'evolutionary software development process' ?

d) [5 Marks]
In the UP, what is the purpose of the construction phase? What happens during the construction phase?

Question 3 [25 Marks]

a) [5 Marks]
Describe in detail the expert design pattern.

b) [10 Marks]
Why is low coupling an important characteristic of an OO design?

c) [10 Marks]
Describe in detail the “Gang of Four” strategy design pattern.

Question 4 [25 Marks]

a) [10 Marks]

Create a UML State Machine Diagram for the behaviour as described.

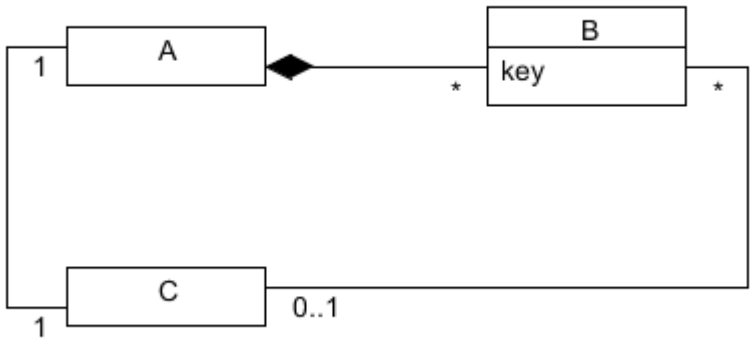
A window in a window management system can be displayed in one of three states :

- *maximised, where it takes up the entire screen;*
- *normal, where it is displayed as a bordered window with a given size and position on the screen;*
- *iconized, where it is displayed as a small icon.*

When a window is opened, it will be displayed as a normal window.
A normal window and an icon can be maximised.
A maximised window and a normal window can be minimised to an icon.
Maximised windows can be restored to their normal size, and icons can be restored to the size they had before there were minimised.
Icons and normal windows can be moved, and normal windows can also be resized.
No matter how it is displayed, a window can always be closed.

b) [15 Marks]

Given the following schematic domain model and contract, draw an appropriate interaction diagram knowing that an instance of A must be the controller.

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Contract
Name :                  MessageA(K: Key, S: Boolean) : Error|OK
Responsibilities :      ...
Preconditions : A and C exists
Postcondition :
Let bk be the instance of B such as B.key == K
-  If bk is null
      -  Error is returned    (return value set)
-  If S is true
      -  C is associated bk (association formed)
      -  OK is returned (return value set)
-  If S is false and C is associated with bk
      -  the association between C and bk is deleted (association
         deletion)
      -  OK is returned (return value set)
-  If S is false and C is not associated with bk
      -  Error is returned    (return value set)
```

Question 5 [25 Marks]

a) [8 Marks]

Given the following problem description :

A store sells and rents video games. When a shipment of new games arrives at the store, some of them are put on the "for sale" shelves. Others are labeled with a barcode and are put on the "for rent" shelves.

Only members can rent games. A customer rents a game by bringing the game to the clerk, who records the game on the customer's account. The customer can keep a game for five days, when he returns the game he pays according to how many days he kept the game. If he is late, he must pay a fine.

A customer buys games by bringing them to the clerk. The price is computed and a receipt is given to the customer.

The owner of the store needs to produce management reports.

In addition,

- *if a customer who rented a game is late more than a week in returning the game, a reminder message should be sent to the customer. The system keeps sending reminder messages at intervals of one week until the customer returns the game.*
- *the owner can decide to sell a previously "for rent" game by putting it on the "for sale" shelf*
- *once a video game is sold, it is removed from the system*

create a domain model for the system as described

b) [4 Marks]

Why is high levels of coupling a problem in a design?

c) [6 Marks]

What is the Vision document in the Unified Process? What is its purpose?

d) [7 Marks]

What is data-driven design? What are its benefits? What are its disavantages?