INSTITUTE OF TECHNOLOGY CARLOW

No: ???A

SCHOOL OF SCIENCE

DEPARTMENT OF COMPUTING AND NETWORKING

AUTUMN EXAMINATIONS 2010

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

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

Course Year: 2

Subject: **Games Engineering I**

Duration: **3 Hours**

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

INSTRUCTIONS TO CANDIDATE:

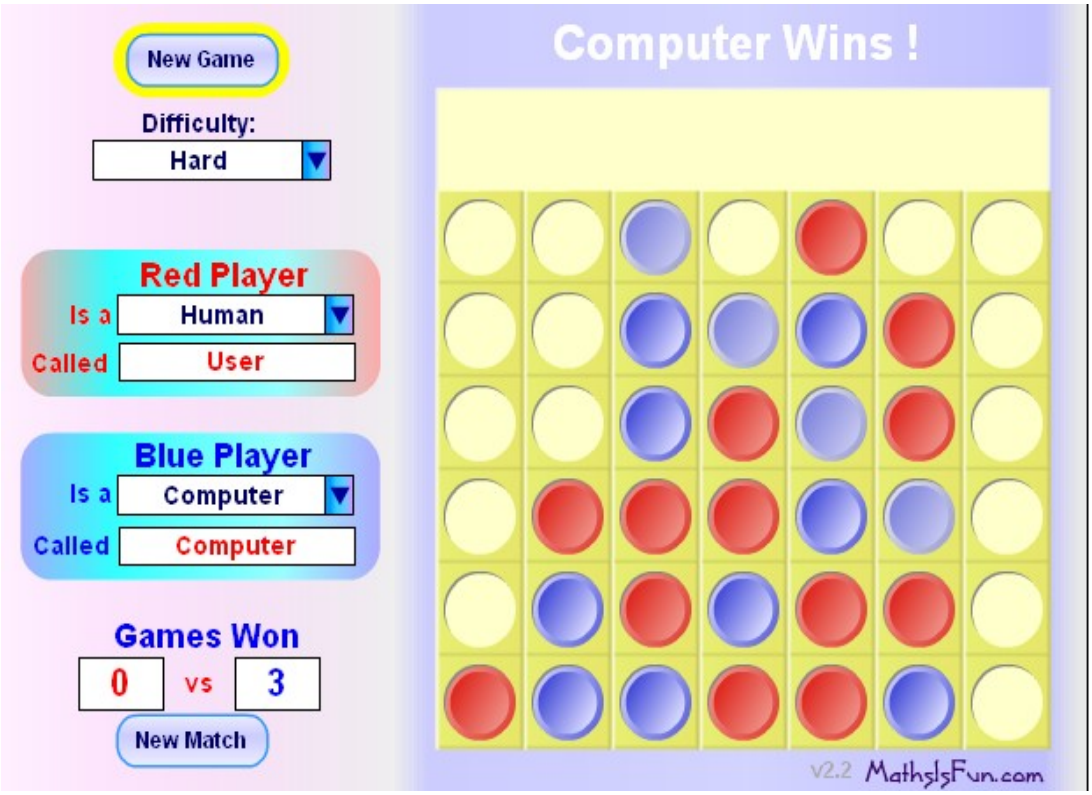
1. **Write your Name, Course, Course Year and Class Group on your answer book;**
2. **Marks as indicated in brackets;**
3. **Answer Question 1 and two other Questions.**

Question 1 {Compulsory} [50 Marks]

We wish to develop, for the Google Android operating system, a version of the classic game 'Connect Four' aka 'Four in a Row'. A Wikipedia article summarises the rules as follows:

"Connect Four [...] is a two-player game in which the players first choose a color and then take turns dropping their colored discs — known as "checkers" in the United States — from the top into a seven-column, six-row vertically-suspended grid. The pieces fall straight down, occupying the next available space within the column. The object of the game is to connect four of one's own discs of the same color next to each other vertically, horizontally, or diagonally before one's opponent can do so. There are many variations on the board size, the most commonly used being 7×6, followed by 8×7, 9×7, and 10×7." [http://en.wikipedia.org/wiki/Connect_Four]

A proposed look for the GUI is given below



[http://www.mathsisfun.com/games/connect4.html]

We propose that a player should be able to choose various board size, colours etc. (and everything else that can be inferred from the screen shot above), play against the computer (by invoking a third party AI algorithm with various levels of difficulty that we have already purchased). No game saving functionality should be provided, but previous settings must be remembered by the application.

Since the game must be highly portable (we have plans to port it to other current mobile operating systems and any future ones) and be easy to maintain (we have plans

to add many new unique functionalities to this game!), please ensure that your solution is of high quality from an object oriented point of view.

a) [4 Marks]
Draw a suitable use case diagram for the game as described.

b) [6 Marks]
Write the "play" and "game set-up" use cases in a fully detailed style using the following format:

- name:
- actor(s):
- description:
- main success scenario:
- alternatives:

c) [10 Marks]
Draw a rich UML domain model to support the entire system as described; your solution must include a Disc class to model the individual disc objects (one of our plan includes the use of various rival politicians images on the individual disc ...).

d) [5 Marks]
Draw the necessary UML system sequence diagrams for the "play" and "game set-up" use cases.

e) [10 Marks]
Only considering the postconditions, write the contracts for the system operations of the "play" and "game set-up" use cases.

f) [8 Marks]
Draw the necessary UML interaction diagrams for the system operations of the "play" and "game set-up" use cases.

g) [7 Marks]
Draw the UML design class diagram of your work so far to support the "play" and "game set-up" use cases.

Question 2 [25 Marks]

a) [10 Marks]
Describe the roles that use cases can play during the entire development process of a computer game.

b) [5 Marks]
What is meant by an agile approach to software development?

c) [5 Marks]
Within an evolutionary development process, which guidelines would you give regarding the duration of an individual iteration. Justify your answer.

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 singleton design pattern.

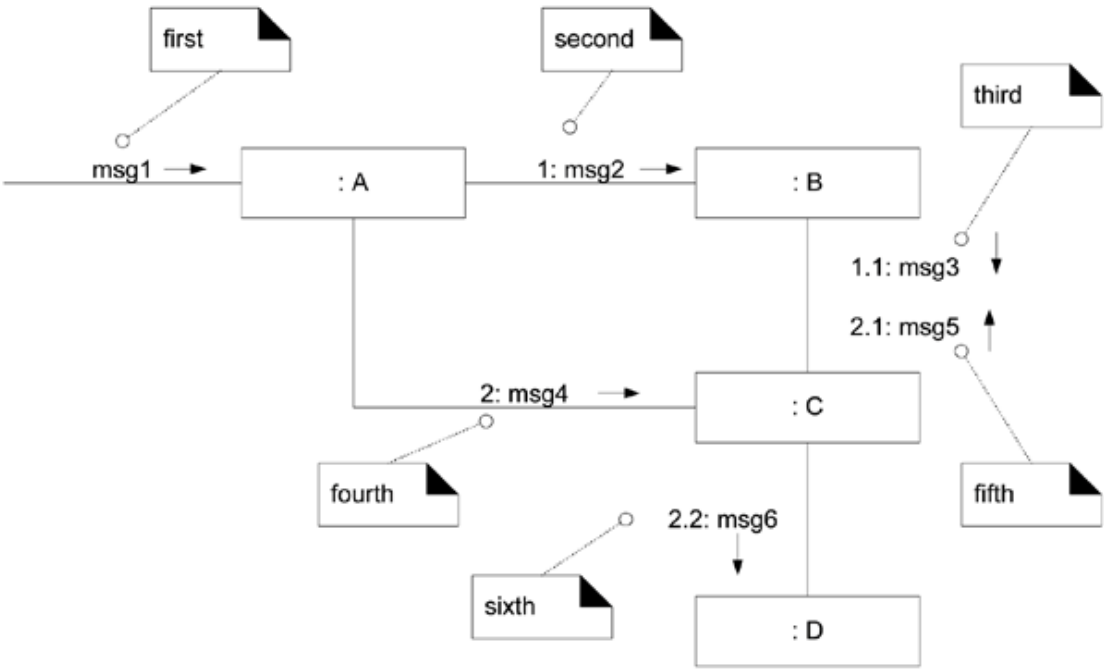
b) [15 Marks]
Explain the rationale behind, and the solutions offered by, the protected variations design pattern.

c) [5 Marks]
Describe in detail the high cohesion design pattern.

Question 4 [25 Marks]

a) [15 Marks]
In Pac-Man, ghosts may be in various states (they may roam randomly, chase, evade, eaten by Pac-Man or eating Pac-Man) according to events. Events that are interesting include, whether they are blue (in which case they may be eaten by Pac-Man), whether they are in line of sight of Pac-Man and start chasing, whether they are being eaten by Pac-Man or eating Pac-Man.
If you feel that there are problems with the description of the system above, resolve them yourself by stating assumptions in your answers.
Create a UML State Machine Diagram for the behaviour as described.

b) [5 Marks]
Draw an equivalent sequence diagram to the diagram below.



c) [5 Marks]
Write, in a programming language of your choice or in pseudo code, the code for the classes mentionned in the diagram above that respects the logic of the diagram.
Include the data members and the methods.

Question 5 [25 Marks]

a) [8 Marks]
What is data-driven design? What are its benefits? What are its disadvantages? Explain an example of its usage in games development.

b) [5 Marks]
What role do interaction diagrams play during the coding phase?

c) [6 Marks]
In the UP, what is the contents of a typical supplementary specification?

d) [6 Marks]
Describe the advantages and disavantages of a UML tool of your choice, that you have used, for agile development purposes.