ATHLONE INSTITUTE OF TECHNOLOGY

SCHOOL OF ENGINEERING

SEMESTER 1 EXAMINATIONS 2015

December Session

<u>BSc (Hons) SOFTWARE DESIGN (GAME DEVELOPMENT)</u>

<u>YEAR 3</u>

<u>GAME THEORY AND MULTICORE 3</u>

External Examiner(s): **Dr. Chris Exton**
Mr. Jerh O'Connor

Internal Examiner(s): Dr. Mark Daly

Instructions to candidates:
Read all questions carefully.
All questions carry equal marks.
Answer **Three** out of **Four** questions.

Time Allowed: 2 Hours

No. of pages including cover sheet: 3

Q.1. (a) Define the following:

1. An n-person game in extensive form. (3 Marks)
2. A pure strategy. (3 Marks)
3. A saddle point. (3 Marks)

(b) Alan and Bill play a game. Alan has a real fly and a fake fly and Bill a fly swatter. The purpose of the game is that Bill should swat the real fly. The game proceed thus:

1. Alan chooses one of his flies and conceals it with his hand on the table.
2. Bill decides whether to swat or not and makes his move when Alan removes his concealing hand.
3. If Bill swats then he wins €1 if the fly was real and loses €1 if not.
4. If Bill doesn't swat and the fly was real then there is no payoff and the game ends (the fly has flown).
5. If Bill doesn't swat and the fly was fake then the game is replayed for double stakes with the change that if Bill doesn't swat the fake fly he wins €2 and the game ends.

Develop this game in extensive form by drawing the game tree, the game matrix, and state the pure strategies for Alan and Bill. What, if any, is Bill's best pure strategy?

(11 Marks)

[20 Marks]

Q.2. (a) For a two person zero-sum game

1 What is a mixed strategy? (3 Marks)
2. What is a *maximin* strategy? (2 Marks)
3. What is a *minimax* strategy. (2 Marks)

(b) Using the definitions in (a), state the Minimax Theorem

(2 Marks)

(c) What is domination and how is it used to compute optimal strategies?

(5 Marks)

(d) Consider the game matrix

$$\begin{pmatrix} 2 & 1 & 0 & 5 & 7 \\ 1 & 2 & 6 & 3 & 3 \\ 4 & 1 & 5 & 1 & 2 \end{pmatrix}$$

Find its optimal strategies. (6 Marks)

[20 Marks]

Q.3. (a) Use linear programming to find the optimum mix of strategies for a two person zero sum game whose game matrix, A, is given below:

$$A = \begin{pmatrix} 1 & -2 & 3 & 4 \\ 2 & 1 & 2 & 5 \\ 0 & 3 & -1 & -3 \end{pmatrix}$$

(16 Marks)

(b) What is the value of the game for Player 1 in the game represented by A above?

(1 Marks)

(c) In relation to the Simplex Algorithm, what is a basic feasible point (bfp)?

(3 Marks)

[20 Marks]

Q.4. (a) Describe in detail how Graphics Processor Units (GPU's) have become a potential solution for cost-effective massively parallel computing architectures. In your answer, refer specifically to the role of CUDA is opening such GPU's to mainstream parallel tasks.

(14 Marks)

(b) What advantages does MPI have over GPU processing?

(3 Marks)

(c) What advantages does CUDA have over MPI? (3 Marks)

[20 Marks]