Exam Performance Feedback Form

CS3191

2004/2005

General remarks: 98 students sat the exam. The results were rather better than for previous years, and so was the overall quality of answers, leading to an overall average of above 60%. Quite a few people had practised enough so that they could get almost full marks for Questions 1 and 2, and it was good to see that this year, the answers to Questions 4 and 5 weren't just the efforts of the last ten minutes of writing. A general recommendation for answering questions like 4 and 5 is to imagine that one is talking to somebody who *doesn't* know anything about the course, that way one is less likely to forget vital information that has become so familiar that one tends to just assume it.

Question 1. About 93% decided to try this question. All in all this question was well answered and achieved an average mark of almost 64% and 28 had a mark of 18 or higher. The average is pulled down by a few very low marks for students who clearly didn't know what they were doing.

This is quite a bit better than when I asked a very similar question in 2002/2003. Of course that may have something to do with the fact that I was asked to explain how to answer that very question in the revision session!

Reasons why marks were lost typically were:

(a) Not giving the correct information sets in the game tree (what does a player know when he or she is making a move)? A surprisingly large number of students ended up with the wrong pay-offs. More often than usual there were trees which clearly didn't fit the game described (drawing cards *after* deciding whether to bluff/call, leaving out the draw entirely). Those who drew a separated tree (the draw and then the game) similar to the example of Simplified Poker in the lecture notes lost a mark for not indicating information sets.

(b) The most frequent mistake (although less frequently than in the past) was to give as strategies instructions which did not cover every position a player might find himself in. (Ie giving four strategies described by: 'If Alice gets a red card, she'll bet'; 'if Alice gets a red card, she'll fold'; 'if Alice gets a black card she'll call'; 'if Alice gets a black card she'll fold'.) Instead, a strategy must say what the player will do in either one of those cases. There were some people who gave pay-offs for Alice, but had her as the column player (the player for which the pay-offs are given should always be the row player!), which lead to some problems.

(c) People who had the wrong strategies typically had a much less complicated calculation to do for the matrix (probabilities didn't really feature there) so they lost quite a few marks here.

(d) The correct matrix has one pure strategy equilibrium point, but as long as people found the ones for their matrix they didn't lose marks here.

(f) Some students had problems with determining the value (pay-off for Player 1 at the equilibrium point(s)). I got a lot of answers where the proposed value was 0 (the actual value is $-1/4$) but they claimed the game still wasn't fair for some reason or other.

Question 2. About 94% decided to answer this question. Very few of them did not know what they were supposed to do and got very low marks. The vast majority did extremely well with this question; 25 got a mark of 18 or higher. It had an average mark of more than 68%.

Reasons why some marks were lost typically were

(a) Some students forgot to give the value, losing a mark. A few missed out one or more of the four (pure strategy) equilibrium points for some reason, even fewer tried to solve this using dominance arguments—and as a result didn't find all pure strategy ones. (Note that I did not ask for mixed strategy equilibrium points and no marks were awarded for talking about those.) Some people didn't give the actual strategy pairs but only circled some entries in the matrix, which lead to a deduction of points, and some people were confused about the fact that in the first strategy is for the row player and the second for the column player.

(b) A lot of people had problems reducing this matrix, they either didn't seriously try the question at all (randomly removing rows and columns doesn't count!), they removed strategies despite the fact that their calculations showed that it couldn't be done, or they tried to remove the wrong strategies, or used the wrong combination.

(c) Some people miscalculated the pay-off at the purported equilibrium point ($-1/12$). A lot of the time the argument for why this couldn't be an equilibrium point varied between plain wrong or rather vague. There are two correct ways of doing this: Show that there is a pure strategy that one of the players can switch to which improves his pay-off (and *one* such strategy is enough, a lot of people kept trying more, losing time!), or argue that we already know that $((1/3, 1/3, 1/3), (1/3, 1/3, 1/3))$ is an equilibrium point, and since all equilibrium point for a 2-person zero-sum game have to lead to the same pay-off, and that for the real equilibrium point is 0, the purported one can't work.

(d) It was a bit disappointing to see how many people made mistakes here. Typical ones:

- confuse Player 1 and Player 2;
- confuse which component is being calculated (probability for first strategy or probability for second strategy);
- read off the wrong equations;
- solve the correct equations and then pair up the two solutions, that is, $(5/12, 1/2)$ instead of the correct $((7/12, 5/12), (1/2, 1/2))$.

Question 3. Only 7 students decided to answer this question, which was the hardest in the exam (and which had been announced as such a number of times). Most of these didn't really know what they were doing, but one person achieved full marks. The average mark was 40%.

Reasons why marks were lost were typically

(a) getting one or more components wrong in the matrix (apparently the probabilities confused some);

(b) this is about (collective) stability as defined in the lecture notes, for which some people made up their own definition; also, I expected a solid argument along the lines of: 'in a population of fighters, a FIGHTER will on average receive -40 per contest (because he will fight almost exclusively against other FIGHTERS), whereas an invading PACIFIST will receive an average pay-off of 0 (he'll only fight against fighters), which is higher';

(c) This was about deciding what proportion of the population should be FIGHTERS (the remaining ones being PACIFISTS) so that the mix is stable. For that a FIGHTER must have the same expected pay-off to a PACIFIST, which leads to a simple equation to be solved (3/7 FIGHTERS and 4/7 PACIFISTS).

(d) This is really a combination of (a) and (c), only with a third type of individual thrown in. One assumes then that there is a proportion of p FIGHTERS, q PACIFISTS and $(1-p-q)$ BULLIES and determines p and q so that every individual has the same expected pay-off.

Question 4. This question was attempted by 55%. It had an average mark of 53%, which was a bit lower than I had hoped. The highest mark for this question was 18, achieved by only 2 students.

The marking scheme was as follows: (a) 3 marks for stating the three constituent parts, 3 further marks for a description of each, 4 marks for describing how they work together. (b) 4 marks for describing the board presentation for the chosen game, 4 marks for describing move generation, and a further 2 marks for explaining one's choice.

I marked part (a) fairly generously, in that everybody who named the three major components (board representation and rule generation, evaluation function, alpha-beta search) and could say something sensible about each got 6 marks. Very few students described how the parts interacted, although that was specifically asked for. Many students performed a memory dump by writing down everything they remembered from the lecture notes about those three components, but from the marking scheme it can be seen that this wasn't worth the time spent on it.

In part (b) I was generous about it if people weren't entirely sure regarding the rules of their chosen game. Quite a few answers contained more than one presentation for the board, but no extra marks were available for that. Similarly some answers contained information about how an evaluation function might work, or which variant of alpha-beta search might be used, but again, these were irrelevant to the question as asked.

Many answers were somewhat confused, or contained at least some wrong statements in part (a), which, after all, was pure bookwork. I didn't mark anybody down for that, but merely awarded marks for the correct and relevant statements I could find. If this question had been subdivided further the marks would probably have been lower!

Question 5. About 47% chose this question. It had an average mark of 62.5%. The quality of answers by and large was much better than last year. Reasons that marks were lost were typically the following. Only one person managed to get 18 or more marks.

(a) Forgetting to describe the Prisoners' Dilemma game or forgetting to describe the repeated game; some only gave the pay-offs of the original story rather than the generalized version. (There were five marks available here, after all—those had to go somewhere!)

(b) Most could define the indefinite game, but only a handful of people seemed to recall the existence of Proposition 5.2.

(c) Most people got all three marks for this.

(d) This was a speculative question and as such marked generously. I was a bit disappointed that quite so many people chose TitForTat as the strategy they'd submit, and that very few had interesting ideas for submitting several strategies.