Universitetet i Stavanger

EXAMINATION PAPER

Subject number: MØA290

Subject: Applied game theory

Examination day and date: Friday May 25

Hours: 09.00-13.00

Number of pages: 5 (including this one)

Number of assignments: 8

Number of enclosures:

Allowed remedies: Non-programmable calculator

Comment:

Good luck!!

THE CANDIDATE MUST CONTROL THAT THE EXAMINATION PAPERS ARE COMPLETE.

Problem 1

a) What is a strategy?
b) What is a dominated strategy?
c) What does it mean to play best response?
d) Consider the game below. Is Player 1's strategy M dominated? If yes, describe a strategy that dominates M. If no, describe a belief where M is best response.

1 \ 2	X	Y
K	9, 2	1, 0
L	1, 0	6, 1
M	3, 2	4, 2

Problem 2

a) What is a Nash equilibrium?
b) Find the Nash equilibria in the following game:

1 \ 2	L	C	R
U	2, 0	1, 1	4, 2
M	3, 4	1, 2	2, 3
D	1, 3	0, 2	3, 0

c) What is a rationalizable strategy?
d) Do there exist rationalizable strategy profiles in the game that are not Nash equilibria?

Problem 3

Consider the following game:

1 \ 2	L	M	R
U	x, x	$x, 0$	$x, 0$
C	$0, x$	2, 0	0, 2
D	$0, x$	0, 2	2, 0

Find Nash equilibria in pure and mixed strategies, and show how they depend on *x*. Show the difference between x>1 and x<1.

Problem 4

Consider the following game, describing a contractual relationship:

1 \ 2	I	N
I	z_1, z_2	y_1, x_2
N	x_1, y_2	0, 0

a) Use the game to explain the concepts of expectation damages and reliance damages.
b) Show when and why expectation damages are efficient.

Problem 5

Consider a game in which player 1 first selects between I and O. If player 1 selects O, then the game ends with payoff vector (4,1), i.e. 4 to player 1 and 1 to player 2. If player 1 selects I, then player 2 can observe this move, and the players then play a "battle of the sexes" game in which they simultaneously and independently choose between A and B. If they both play A, then the payoff vector is (3,1). If they both play B, then the payoff vector is (1,3). If one of the players play A, while the other play B, then the payoff vector is (0,0).

a) Represent this game in the extensive and normal forms.
b) Find the Nash equilibrium in pure strategies.
c) Represent the proper subgame (battle of the sexes) on normal form and find equilibria in pure and mixed strategies.
d) What are the subgame perfect Nash equilibria in pure strategies (for the whole game). Are there any Nash equilibria that are not subgame perfect?

Problem 6

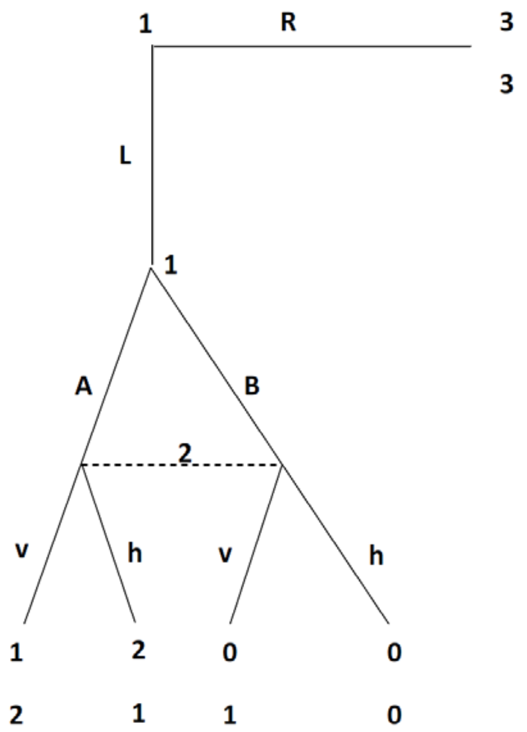
Pia is a clever accountant, as well as a skilled leader. And now she is negotiating the possibility of a new position with the CEO of the company. The contract specifies the salary w, as well as her task: accounting or management. If she works as accountant, she gets a payoff of w- 5.000 and the company gets 100.000 – w. If Pia works as a manager, she gets a payoff of w- 30.000, while the company gets x-w. If the parties do not agree, the company gets 0, while Pia gets u in another job.

Assume x>150.000 and u<95.000. Pia's bargaining power is given by π_{P}, while the company's bargaining power is given by π_{C}.

a) Solve the bargaining problem by the use of standard barganing solution: What should Pia work with and what will be paid?
b) Suppose Pia can invest in human capital, i.e. choose between two courses, A and B. Course A improves her management skills, thereby increasing x. Course B strengthen her outside options as an account, thereby increase u. What should Pia choose?

Problem 7

Consider the following game:



a) How many subgames are there in the game?
b) Describe the set of possible strategies for each player
c) Find all pure strategy Nash equilibria.
d) Find all sub games and the pure strategy sub-game perfect Nash equilibria of the game.

Problem 8

The stage game below, where $1 < x < 4$, is played twice, with the outcome in the first stage observed before the second stage begins. The players move simultaneously. There is no discounting.

	L	M	R
U	1,1	5,0	0,0
M	0,5	4,4	0,0
D	0,0	0,0	x,x

a) For which x can the outcome (M,M) be achieved in the first stage in a pure-strategy subgame perfect Nash equilibrium? Give the strategies that do so.
b) Consider an infinitely-repeated game with stage game given by the payoff matrix in (a). Payoffs are discounted with a discount factor $\delta \epsilon (0,1)$. For which discount factors can the outcome (M,M) each period be obtained as a subgame perfect equilibrium outcome, assuming the players use trigger strategies?