

# Exam solutions 2019-01-07

ENM140, Game theory and rationality 2018

## Question 1

Consider a two-player simultaneous action game, where Player 1 has actions  $A$  and  $B$  and Player 2 has actions  $c$  and  $d$ . The payoffs are given by

	$c$	$d$
$A$	$(0, 0)$	$(-1, 1)$
$B$	$(1, -1)$	$(0, 0)$

### 1.1

The pure-strategy profile  $(B, d)$  is a strict Nash equilibrium.

**True**

### 1.2

The pure-strategy profile  $(A, c)$  is Pareto optimal.

**True**

### 1.3

The game has exactly 4 action profiles.

**True**

### 1.4

The minmax value for Player 2 is 0.

**True**

## Question 2

Consider the infinitely repeated game with average payoffs where the simultaneous-action stage game (one-round game) is the game specified in question 1 above.

### 2.1

The repeated game has a Nash equilibrium with payoff profile  $(-1/2, 1/2)$ .

**False**

Not enforceable.

### 2.2

The payoff profile  $(1, 0)$  is feasible.

**False**

## Question 3

Consider a two-player simultaneous action game where both players have actions  $A, B, C$ . The payoffs are given by

	$A$	$B$	$C$
$A$	$(1, 1)$	$(0, 1)$	$(0, 0)$
$B$	$(1, 0)$	$(2, 2)$	$(0, 0)$
$C$	$(0, 0)$	$(0, 0)$	$(3, 3)$

### 3.1

The pure-strategy profile  $(B, B)$  is a strict Nash equilibrium.

**True**

### 3.2

The pure-strategy profile  $(A, A)$  is a weak Nash equilibrium.

**True**

### 3.3

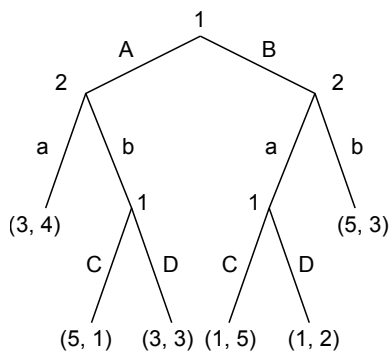
The game has exactly one mixed-strategy Nash equilibrium, i.e., where at least one player has a probability of an action strictly between 0 and 1.

**False**

There are multiple mixed-strategy Nash equilibria.

## Question 4

Consider the two-player game depicted below.



### 4.1

The game is written in extensive form.

**True**

### 4.2

This is a perfect information game.

**True**

### 4.3

Player 1 has no strictly dominated pure strategy.

**True**

4.4

There are exactly two subgame-perfect Nash equilibria.

**False**

4.5

All pure strategy profiles where Player 1 chooses action A are Pareto optimal.

**False**

4.6

Player 1 has exactly 4 pure strategies.

**False**

4.7

The game has exactly 32 pure strategy profiles.

**True**

4.8

The game has exactly 8 pure-strategy Nash equilibria.

**True**

4.9

All Pareto optimal pure-strategy profiles in this game are Nash equilibria.

**False**