Name:	Neptun code:

Collective Intelligence, 2024-2025. fall semester Endterm Test, 2025-01-03, Group A

In the Iterated Prisoner's Dilemma game, will the strategy called Tit-For-Tat (TFT) beat the strategy called ALLD? Why? (1p)

Analyze the two-person, symmetric game below (1p)

Is there a dominant strategy for the players? If yes, which one and why? If not, why?

Is there a mixed strategy Nash Equilibrium? If yes, what is it? Explain your answer!

А		В	
А	4, 4	1, 5	
В	5, 1	0, 0	

Foraging by Ants (1p)

In the model of foraging ants, consider the matrix below. The agent is in the middle cell (marked by X), heading North-East. The numbers in the cells represent the pheromone levels perceived by the ant at the given location. Write in in each cell the probability that the agent's next step will take it to the given cell.

10	15	15
10	X 5	20
10	5	10

What is an attractor? (1p)

Be as precise as you can. Give examples of at least 2 different types of attractors!

Replicator Dynamics (1p)

Let's consider the game with the payoff matrix below:

	А	В	С
А	5	1	2
В	2	5	1
С	1	2	5

If in a population of players, the ratio of players playing A is denoted by x_A , the ratio of players playing B is by x_B and the ratio of players playing C is by x_C , then using *replicator dynamics* what are the following dynamic rules?

$$\frac{dx_A}{dt} =$$

$$\frac{dx_B}{dt} =$$

 $\frac{dx_C}{dt} =$

Name:	Neptun code:

Collective Intelligence, 2024-25. fall semester Endterm Test, 2025-01-03, Group B

What strategy will win if ALLC plays against TFT in the Iterated Prisoner's Dilemma? (1p)

Analyze the two-person, symmetric game below (1p)

Is there a dominant strategy for the players? If yes, which one and why? If not, why?

Is there a mixed strategy Nash Equilibrium? If yes, what is it? Explain your answer!

А		В	
А	6, 6	1, 3	
В	3, 1	2, 2	

Foraging by Ants (1p)

In the model of foraging ants, consider the matrix below. The agent is in the middle cell (marked by X), heading South-East. The numbers in the cells represent the pheromone levels perceived by the ant at the given location. Write in in each cell the probability that the agent's next step will take it to the given cell.

11	6	11
5	X 12	6
21	5	22

What is stigmergy? (1p)

Explain the basics of the concept. Give examples!

Replicator Dynamics (1p)

Let's consider the game with the payoff matrix below:

	А	В	С
А	40	20	5
В	5	40	20
С	20	5	40

If in a population of players, the ratio of players playing A is denoted by x_A , the ratio of players playing B is by x_B and the ratio of players playing C is by x_C , then using *replicator dynamics* what are the following dynamic rules?

 $\frac{dx_A}{dt} =$

 $\frac{dx_B}{dt} =$

 $\frac{dx_C}{dt} =$