COMP3121 Social and Collaborative Computing

Homework 5

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Question 1

Statement 1 is correct.

If player B choose L, player A will choose D; if player B choose R, player A will choose U. so **player A do not have dominant strategy.** If player A choose U, player B will choose R; if player A choose D, then player B will choose L. So **player B do not have dominant strategy.**

Then both of player A and B do not have dominant strategy, then statement 1 is correct, other three are wrong.

Question 2

Statement 2 is correct. Need more external information to make decision.

When multiple Nash Equilibria exists, player needs more information to predict. There may be other factors influence the result, and maybe all players try different ways to achieve the Nash Equilibrium, then may not reach the Nash Equilibrium as the result. Therefore need more external information to make the decision.

Question 3

Statement 1, 3, 5 is correct.

Pure strategy: If A choose U, then B will choose R; if A choose D, then B will choose L; if player B choose strategy L, A will choose D; if B choose R, A will choose U. Then (D, L) and (U, R) are two Nash Equilibrium. So statement 1, 5 are correct.

Mixed strategy: Assume probability of A choose U is p, and probability of B choose L is q.

Expectation (of A choose U) = $1 \times q + 4 \times (1 - q) = 4 - 3q$

Expectation (of A choose D) = $3 \times q + 2 \times (1 - q) = 2 + q$

Then $4 - 3q = 2 + q$, $\boldsymbol{q = \frac{1}{2}}$

Expectation (of B choose L) = $p \times 1 + (1 - p) \times 3 = 3 - 2p$

Expectation (of B choose R) = $p \times 2 + (1 - p) \times 2 = 2$

Then $3 - 2p = 2$, $\boldsymbol{p = \frac{1}{2}}$

Then $\left(\frac{1}{2}, \frac{1}{2}\right)$ is the Nash equilibrium, so statement 3 is correct. Then statement 1, 3, and 5 are correct.

Question 4

Statement 2 is correct.

Assume probability of A choose U is p, and probability of B choose L is q.

Expectation (of A choose U) = $5 \times q + 0 \times (1 - q) = 5q$

Expectation (of A choose D) = $4 \times q + 2 \times (1 - q) = 2 + 2q$

Then $5q = 2 + 2q$, $\boldsymbol{q = \frac{2}{3}}$

Expectation (of B choose L) = $p \times 6 + (1 - p) \times 4 = 4 + 2p$

Expectation (of B choose R) = $p \times 10 + (1 - p) \times 2 = 2 + 8p$

Then $4 + 2p = 2 + 8p$, $\boldsymbol{p = \frac{1}{3}}$

Then $\left(\frac{1}{3}, \frac{2}{3}\right)$ is the Nash equilibrium, so statement 3 is correct. Then statement 2 is correct.

Question 5

Statement 3 is correct.

If A choose U, then B will choose L or R; if A choose D, then B will choose R; if B choose L, then A will choose U; if B choose R, then A will choose D. **So (D, R) and (U, L) are two Nash Equilibrium. So there exists Nash equilibrium.**

Player A has no dominant strategy. Player B can choose R as a weak dominant strategy. Then **(D, R) is the Nash equilibrium with weak dominant strategy. So there exists Nash equilibrium using weak dominant strategy.**