Quiz 6 Solutions

1. **Question 1:** 5 points

   Refer to the quiz sheet for the problem statement.

   - **Solution:**

     Use Reduction by Dominance on the given payoff matrix to get the following.

     Version A

     $$\begin{bmatrix} 12 & 18 & 25 \\ 16 & 15 & 14 \end{bmatrix}$$

     Version B

     $$\begin{bmatrix} 26 & 18 \\ 15 & 21 \end{bmatrix}$$

     The **grading scheme** for this question is as follows:

     - 1 mark off for incorrect objective function
     - 0.5 mark off for incorrect objective row (check signs)
     - 0.5 mark off for no z or P column present in tableau

2. **Question 2:** 5 points

   Refer to the quiz sheet for the problem statement.

   Part (a) - 2.5 points

   - **Solution:**

     Find the Payoff Matrix:

     Version A

     $$\begin{bmatrix} -1 & \frac{1}{2} & 1 \\ \frac{1}{2} & -2 & \frac{1}{2} \\ 1 & \frac{1}{2} & -3 \end{bmatrix}$$

     Version B

     $$\begin{bmatrix} -1 & \frac{3}{2} & 2 \\ \frac{3}{2} & -2 & \frac{5}{2} \\ 2 & \frac{5}{2} & -3 \end{bmatrix}$$

     The **grading scheme** for this question is as follows:

     - 2.5 marks for correct answer
     - 2 marks for correct answer, incorrect signs

Part (b) - 2.5 points

Version A

LP problem for the column player's optimal strategy.

$$\begin{aligned}
\text{Maximize} \quad & z^+ - z^- \\
\text{Subject to} \quad & z^+ - z^- + x_1 - \frac{1}{2}x_2 - x_3 \leq 0 \\
& z^+ - z^- - \frac{1}{2}x_1 + 2x_2 - \frac{1}{2}x_3 \leq 0 \\
& z^+ - z^- - x_1 - \frac{1}{2}x_2 + 3x_3 \leq 0 \\
& x_1 + x_2 + x_3 \leq 1 \\
& -x_1 - x_2 - x_3 \leq -1 \\
& z^+, z^-, x_1, x_2, x_3 \geq 0
\end{aligned}$$

Version B

LP problem for the row player's optimal strategy.

$$\begin{aligned}
\text{-Maximize} \quad & -z^+ + z^- \\
\text{Subject to} \quad & -z^+ + z^- - y_1 + \frac{3}{2}y_2 + y_3 \leq 0 \\
& -z^+ + z^- + \frac{3}{2}y_1 - 2y_2 - \frac{5}{2}y_3 \leq 0 \\
& -z^+ + z^- + 2y_1 + \frac{5}{2}y_2 - 3y_3 \leq 0 \\
& y_1 + y_2 + y_3 \leq 1 \\
& -y_1 - y_2 - y_3 \leq -1 \\
& z^+, z^-, y_1, y_2, y_3 \geq 0
\end{aligned}$$

The **grading scheme** for this question is as follows:

- 2.5 marks for fully correct answer
- 0.5 marks off for each minor error (objective function, sign, etc.)