Linear Programming PRACTICE 1 Part 1 2019-2020

1. Reduce LPP to the canonical form:

$$Z = -x_1 - 3x_2 + 2x_3 \to max$$

$$\begin{cases} x_1 + 2x_2 - 3x_3 = -1 \\ -2x_1 \quad + \quad 4x_3 \leq 3 \\ 4x_1 - 5x_2 + x_3 \geq 2 \\ x_1, x_2, x_3 \geq 0 \end{cases} \quad \begin{vmatrix} * (-1) \\ +s_1 \\ -s_2 \\ \; \end{vmatrix}$$

$$\tilde{Z} = -x_1 - 3x_2 + 2x_3 + 0 \cdot s_1 + 0 \cdot s_2 \to max$$

$$\begin{cases} -x_1 - 2x_2 + 3x_3 = 1 \\ -2x_1 + \quad 4x_3 \; + \; s_1 = 3 \\ 4x_1 - 5x_2 + \; x_3 \; - \; s_2 = 2 \\ x_1, x_2, x_3, s_1, s_2 \geq 0 \end{cases}$$

It is known that $\tilde{Z}_{max} = \tilde{Z}(\tilde{X}^*) = {}^7/_{13} = 0.5385$

$\tilde{X}^* = \left({}^5/_{13};\ 0;\ {}^6/_{13};\ {}^{25}/_{13};\ 0\right) = (0.3846;\ 0;\ 0.4615; 1.9231; 0)$ **then**

$$Z_{max} = \tilde{Z}_{max} = {}^7/_{13} = 0.5385$$

$$X^* = \left({}^5/_{13};\ 0;\ {}^6/_{13}\right) = (0.3846; 0; 0.4615)$$

2. Reduce LPP to the canonical form:

$Z = 6x_1 - 5x_2 + 7x_3 \to min \quad |*(-1) \qquad \ddot{Z} = -Z = -6x_1 + 5x_2 - 7x_3 \to max$

$$\begin{cases} 2x_1 + x_2 - 3x_3 \leq -5 \\ -5x_1 + 2x_2 + 6x_3 \leq 1 \\ x_1, x_3 \geq 0 \end{cases} \quad \begin{vmatrix} * (-1) \\ \; \\ \; \end{vmatrix} \qquad \begin{cases} -2x_1 - x_2 + 3x_3 \geq 5 \\ -5x_1 + 2x_2 + 6x_3 \leq 1 \\ x_1, x_3 \geq 0 \end{cases} \quad \begin{vmatrix} -s_1 \\ +s_2 \\ x_2 = x_2' - x_2'' \end{vmatrix}$$

$$\tilde{Z} = -6x_1 + 5x_2' - 5x_2'' - 7x_3 + 0 \cdot s_1 + 0 \cdot s_2 \to max$$

$$\begin{cases} -2x_1 - x_2' + x_2'' + 3x_3 - s_1 = 5 \\ -5x_1 + 2x_2' - 2x_2'' + 6x_3 \; + \; s_2 = 1 \\ x_1, x_2', x_2'', x_3, s_1, s_2 \geq 0 \end{cases}$$

It is known that $\tilde{Z}_{max} = \tilde{Z}(\tilde{X}^*) = -{}^{53}/_3 = -17.667$

$\tilde{X}^* = \left(0;\ 0; {}^9/_4;\ {}^{11}/_{12}; 0;\ 0\right) = (0; 0; 2.25; 0.9167; 0; 0)$ **then**

$$Z_{min} = -\tilde{Z}_{max} = {}^{53}/_3 = 17.667$$

$$X^* = \left(0;\ -\ {}^9/_4;\ {}^{11}/_{12}\right) = (0; -2.25;\ 0.9167)$$