HW2-Q1 ✓

2021年1月27日 星期三 16:44

Q1. (a) From the HW1-Q4:

$$\max \text{ revenue} = z = \left\{ \begin{array}{l} 300 \cdot y_1 + 160\, y_2 + 360\, y_3 + \\ 220 \cdot b_1 + 130\, b_2 + 280 \cdot b_3 + \\ 100 \cdot m_1 + 80 \cdot m_2 + 140 \cdot m_3 \end{array} \right.$$

subject to $\Rightarrow$

$$\left\{ \begin{array}{l} y_1 + y_2 + y_3 + b_1 + b_2 + b_3 + m_1 + m_2 + m_3 \leq 30 \\ 0 \leq y_1 \leq 4 \; ; \quad 0 \leq y_2 \leq 8 \; ; \quad 0 \leq y_3 \leq 3 \\ 0 \leq b_1 \leq 8 \; ; \quad 0 \leq b_2 \leq 13 \; ; \quad 0 \leq b_3 \leq 10 \\ 0 \leq m_1 \leq 22 \; ; \quad 0 \leq m_2 \leq 20 \; ; \quad 0 \leq m_3 \leq 18 \end{array} \right.$$

After calculating the system using python $\Rightarrow$

$$\left\{ \begin{array}{lll} y_1 = 4 & b_1 = 8 & m_1 = 0 \\ y_2 = 5 \; , & b_2 = 0 \; , & m_2 = 0 \\ y_3 = 3 & b_3 = 10.0 & m_3 = 0 \end{array} \right.$$

Maximum $z = 7640.0$

(b) Let x_1 donates the number of officers begin working at 0:00
x_2 donates the number of officers begin working at 4:00
x_3 donates the number of officers begin working at 8:00
x_4 donates the number of officers begin working at 12:00
x_5 donates the number of officers begin working at 16:00
x_6 donates the number of officers begin working at 20:00
z donates the number of officers needed.

Formulate the problem:

$$\text{Minimize} \quad z = x_1 + x_2 + x_3 + x_4 + x_5 + x_6$$

subject to:

$$\left\{ \begin{array}{l} x_1 + x_2 \geq 35 \\ x_2 + x_3 \geq 65 \\ x_3 + x_4 \geq 80 \\ x_4 + x_5 \geq 40 \\ x_5 + x_6 \geq 25 \\ x_6 + x_1 \geq 15 \\ x_1, x_2, x_3, x_4, x_5, x_6 \geq 0 \end{array} \right.$$

After calculating the system using python, we obtained:

$$\left\{ \begin{array}{l} x_1 = 0, \quad x_2 = 35, \quad x_3 = 30 \\ x_4 = 50, \quad x_5 = 10, \quad x_6 = 15 \\ \text{the corresponding minimum } z = 140 \end{array} \right.$$