Problem 12–4

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- e_t^s: The flood level in period t at scenario s
- s_t^s: The required water to be imported in period t at scenario s

$$\min \quad \sum_{s=1}^{81} p_s \sum_{t=1}^{4} (5000 s_t^s + 10000 e_t^s)$$

$$x_0^s = -150 \quad \forall s \in [1, 2, \ldots, 81]$$

$$x_t^s = x_{t-1}^s + level_t^s - y_t^s \quad \forall s \in [1, 2, \ldots, 81], \forall t \in [1, 2, 3, 4]$$

$$x_t^s - e_t^s \leq 0 \quad \forall s \in [1, 2, \ldots, 81], \forall t \in [1, 2, 3, 4]$$

$$x_t^s + s_t^s \geq -250 \quad \forall s \in [1, 2, \ldots, 81], \forall t \in [1, 2, 3, 4]$$

Nonanticipativity Constraints (t = 1):

$$\begin{aligned} x_1^s = x_1^r, y_1^s = y_1^r \quad & \forall s, r \in [1, 2, \ldots, 27] \\ x_1^s = x_1^r, y_1^s = y_1^r \quad & \forall s, r \in [28, 29, \ldots, 54] \\ x_1^s = x_1^r, y_1^s = y_1^r \quad & \forall s, r \in [55, 56, \ldots, 81] \end{aligned}$$

Nonanticipativity Constraints (t = 2):

$$\begin{aligned} x_2^s = x_2^r, y_2^s = y_2^r \quad & \forall s, r \in [1, 2, \ldots, 9] \\ x_2^s = x_2^r, y_2^s = y_2^r \quad & \forall s, r \in [10, 11, \ldots, 18] \\ \vdots & \\ x_2^s = x_2^r, y_2^s = y_2^r \quad & \forall s, r \in [73, 74, \ldots, 81] \end{aligned}$$

Nonanticipativity Constraints (t = 3):

$$
\begin{aligned}
x_3^s = x_3^r, y_3^s = y_3^r \quad & \forall s, r \in [1, 2, 3] \\
x_3^s = x_3^r, y_3^s = y_3^r \quad & \forall s, r \in [4, 5, 6] \\
\vdots & \\
x_3^s = x_3^r, y_3^s = y_3^r \quad & \forall s, r \in [79, 80, 81]
\end{aligned}
$$