Problem 1. Optimize Logistics Distribution

In this problem, you are tasked to solve a logistics distribution problem. You have m orders, n warehouses, and k types of goods. You know the demand for each order, the stock in each warehouse, and the transportation time from each warehouse to each order. Your task is to find a distribution plan to maximize the overall satisfaction and minimize the maximum transportation time.

The given input information is as follows:

- $A1_{m\times n\times k}$: A matrix indicating the unit transportation time for each type of good from the warehouse to the order.
- $A2_{m\times k}$: A matrix indicating the demand for each type of good for each order.
- $A3_{n\times k}$: A matrix indicating the stock of each type of good in each warehouse.
- $W1_m$: A matrix indicating the priority of each order.
- $W2_n$: A matrix indicating the priority of each warehouse.

You need to output the following information:

- $X_{m\times n\times k}$: A matrix indicating the transportation quantity of each type of good from the warehouse to the order.
- $Y_{m\times n\times k}$: A matrix indicating the transportation time of each type of good from the warehouse to the order.
- $Y_{m\times n\times k} = X_{m\times n\times k} \circ A1_{m\times n\times k}$

Your goal is to maximize the following objective function:

$$\text{Maximize } Z = \alpha \cdot \left(\sum_{i=1}^{m} W1_i \cdot \left(\sum_{k=1}^{K} \frac{\sum_{j=1}^{n} X_{ijk} \cdot W2_j}{A2_{ik}} \right) \right) - \beta \cdot \left(\max_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{K} Y_{ijk} \right)$$

where α and β are two weight parameters.

The objective function is a balance between total satisfaction and maximum transportation time. The first term calculates total satisfaction by considering the priority-weighted fulfilment ratio of all orders. For each order, it multiplies the transport quantities by the corresponding warehouse's priority, divides this by the demand for each good to get a fulfilment ratio, and multiplies this by the order priority. The second term represents the maximum transportation time across all orders, goods, and warehouses, to be minimized.

The constraints are:

- $0 \leq \sum_{i=1}^{m} X_{ijk} \leq A3_{jk}$, for all j and k
- $0 \leq \sum_{j=1}^{n} X_{ijk} \leq A2_{ik}$, for all i and k