Module 06 – Transshipment Problem

Exploratory Data Analysis

*In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:*

* *Make a visual graph of your data like what we saw for the sample problem*

A diagram of different types of objects

AI-generated content may be incorrect.

Model Formulation

*Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.*

*Hint: This one differs a bit from the sample problem in terms of Balance-of-Flow*

A screenshot of a computer

AI-generated content may be incorrect.

Model Optimized for Minimal Transportation Cost

*Implement your formulation into Excel and be sure to make it neat. This section should include:*

* *A screenshot of your optimized final model (formatted nicely, of course)*
* *A text explanation of what your model is recommending*
* *Update your graph from the EDA section to bold/color the links being used (and show how much is going through that link)*

*A screenshot of a table

AI-generated content may be incorrect.*

*A table with text on it

AI-generated content may be incorrect.*

Model with Stipulation

*Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.*

*Follow these steps to complete this section:*

1. *Describe the necessity of the Balance-of-Flow for this problem type*
2. *What happens when you change your model to make Total Supply > Total Demand (i.e. add 115 units to one of the sources)*
3. *What happens when you rerun your model?*
4. *What do you need to change to make your model work again?*
5. *Make the changes and report on your findings.*
   1. *PS there is a small chance that the source you added 115 to may make your model infeasible. If so, add the 115 units to a different source.*

The balance-of-flow is necessary in this type of problem to ensure that the total supply matches the total demand. Without this balance, either some supply would go unused, or some demand nodes would not receive the required units, leading to an infeasible solution. This is particularly important in transportation and network flow models, where the goal is to optimize costs while ensuring that supply meets demand.

If 115 units are added to one of the supply sources, the total supply would exceed the total demand, creating an imbalance in the model. When rerunning the model with this excess supply, it would either result in an infeasible solution or require an artificial balancing mechanism to handle the surplus. Some solvers might introduce a dummy demand node to absorb the extra supply, while others might fail to provide a solution.

To make the model work again, the total demand must be adjusted to match the new total supply. This can be done by increasing demand at one or more of the demand nodes, reducing supply elsewhere, or introducing a dummy demand node to account for the excess supply. If the added supply causes an infeasibility issue, it may be necessary to redistribute it to a different source. ***Total transportation costs go up.***