ENGRI 1101	Engineering Applications of OR	Fall 2020	Prelab 6

The Transportation Problem

Name: ______________________________

Objectives:

- Introduce students to the transportation problem
- Give an application of the transportation problem of the "caterer's problem"

Key Ideas:

- supply point and supply constraint
- demand point and demand constraint
- balanced transportation problem
- bipartite graph
- integrality properties
- sensitivity analysis

Reading Assignment:

- Read the first part of Handout 7 on the transportation problem (first 4 pages)

Brief description: In this lab, we will

1. Learn how to formulate a somewhat unexpected problem as a transportation problem
2. Continue to develop our facility in using Jupyter notebooks to solve optimization problems

Read and understand the problem, and think about how you would model it as a mathematical optimization problem (i.e., what is a feasible solution of the problem? What is the objective function? How can you express the objective functions and constraints every feasible solution must satisfy mathematically?).

The Caterer's Problem (From [Winston]) The Carter Caterer Company must have the following number of clean napkins available at the beginning of each of the next four days: day 1, 15; day 2, 12; day 3, 18; day 4, 6. After being used, a napkin can be cleaned by one of two methods: fast service or slow service. Fast service costs 10 cents per napkin, and a napkin cleaned via fast service is available for use the day after it is last used. Slow service costs 6 cents per napkin, and these napkins can be reused two days after they are last used. New napkins can be purchased for a cost of 20 cents per napkin. The catering company currently has no napkins, whatsoever. We wish to meet the demand for the next four days as cheaply as possible.

1. Give one feasible solution to the problem that uses all three options of obtaining clean napkins - buying them new, cleaning them fast, or cleaning them slowly. Compute the objective function value for this solution.
2. Give a lower bound on the cost of *any* feasible solution.