

## Transportation Logistics - Homework 3 (5 points)

### Exercise 1 (3 pts)

A furniture retailer has to deliver one table to each customer. The customers are at locations B to G. The furniture retailer himself is located at A. Since all six tables fit into a single truck only one delivery tour shall be made. The distances between the different locations are given in the following matrix:

$d_{ij}$	A	B	C	D	E	F	G
A	0	6	7	8	8	10	14
B	6	0	11	10	9	11	18
C	7	11	0	2	7	6	8
D	8	10	2	0	5	4	8
E	8	9	7	5	0	3	14
F	10	11	6	4	3	0	13
G	14	18	8	8	14	13	0

- Formulate the problem as a TSP model.
- Implement the model with Excel solver without subtour elimination constraints. (HINT: Put very high costs instead of 0 along the diagonal of the distance matrix). What does your solution look like? How many subtours do you find?
- Determine a solution using the nearest neighbor algorithm.

### Exercise 2 (2 pt)

A major hurricane will hit Florida's coast line three days from now. Based on historical data, the impact based on its current strength can be predicted rather accurately. Since there are still three days left to prepare for the impact of the hurricane, last minute preparations are made. These preparations include the stocking of distribution points with food rations. The considered region is Boca Raton. It consists of Highland Beach (HB), Loxahatchee (LX), Kings Point (KP), Lantana (LA), Greenacres (GR), and Palm Beach (PB). At each population center a distribution point is available. To operate a distribution point, three persons are necessary. Currently, only nine persons have been assigned to Boca Raton. Relief standards state that a walking distance of at most 10 minutes to a distribution point is acceptable. The tables below provide the following information: the predicted number of affected persons per population center, the maximum capacity of each potential distribution point (in terms of food rations), and the predicted time in minutes to reach a distribution point. In the immediate aftermath of a disaster, each person is entitled to receive one food ration. The aim is to maximize the number of affected persons that are able to reach a distribution point and receive a food ration. Formulate the problem as an integer program, using the data from the exercise.

	HB	LX	KP	LA	GR	PB
Affected persons	358	310	215	431	122	510
Maximum capacity	500	400	400	700	400	800

Minutes	HB	LX	KP	LA	GR	PB
HB	0	10	12	6	14	8
LX	10	0	10	8	12	8
KP	12	10	0	10	20	16
LA	6	8	10	0	14	10
GR	14	12	20	14	0	10
PB	8	8	16	10	10	0