IE 534 Linear Programming Quiz

- Date and time assigned: Monday 11/5/2018, 8:00 AM.
- Date and time due: Tuesday 11/6/2018, 5:00 PM.
- Submit ONE pdf document and ONE computer code (Gusek, Octave, or Matlab) on Canvas.
- Submissions at 5:01 PM or later will not be accepted.
- This is an individual quiz. During the period of the quiz, you are NOT allowed to communicate (through conversations, emails, phone calls, messages, etc.) with other people (except the instructor) regarding the quiz problem.
- You can ask the instructor questions regarding the quiz problem by email during the period of the quiz, but your questions will be answered on the course website (without revealing your identity) in order to make sure that everyone in the class has access to the same information.

(100 points) A startup company has decided to open three offices to serve customers in ten cities. As the manager of the company, you need to determine the optimal locations of the three offices. The demands are given in Table 1 and the distances between the cities are given in Table 2. Customers will come to the closest office for services. The objective is to minimize demand weighted total travel distance.

Table 1: Demands in ten cities

City #	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
Demand	50	16	82	46	54	23	93	100	49	92

Table 2: Distances between ten cities

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
c1	0	412	120	230	413	310	195	411	356	688
c2	412	0	472	232	801	324	600	113	561	300
c3	120	472	0	251	439	427	146	442	466	764
c4	230	232	251	0	642	345	391	191	512	532
c5	413	801	439	642	0	563	312	820	379	1037
c6	310	324	427	345	563	0	486	406	246	484
c7	195	600	146	391	312	486	0	582	447	882
c8	411	113	442	191	820	406	582	0	627	381
c9	356	561	466	512	379	246	447	627	0	723
c10	688	300	764	532	1037	484	882	381	723	0

For example, suppose cities c1, c6, and c8 are selected to host the three offices, then customers in cities c1, c3, c5, and c7 will come to the office in c1 (because c1 is closer than c6 and c8), customers in cities c6 and c9 will come to the office in c6, and customers in cities c2, c4, c8, and c10 will come to the office in c8. The demand weighted total travel distance is $(50 \times 0 + 16 \times 113 + 82 \times 120 + 46 \times 191 + 54 \times 413 + 23 \times 0 + 93 \times 195 + 100 \times 0 + 49 \times 246 + 92 \times 381) = 107,977$. But this may not be the optimal solution. You are tasked to formulate an integer linear programming model to find the optimal locations for the three offices.

Your submission should include two things:

1. A single pdf document that includes definitions of parameters and decision variables, formulation of an integer linear programming model, optimal locations of the three offices, and the optimal demand weighted total travel distance.

2. A single document of computer code (your choice of Gusek, Octave, or Matlab) that solves the model and produces the optimal solution.