Final Project - Fall 2019

This the first Question I of the final exam and has weight 20 pts.
Due to 16:00 PM, January 04th, Saturday, 2020

1. **Part I: Clustering** (10 pts.)

   Your task is to determine the clusters of the data given in the *"IE440Final19Clustering.txt"* using

   (a) K-means (batch)
   - Experiment for $K = 5, 10$ and 15 clusters.
   - Run K-means 10 000 times after initializing cluster centers randomly for $K = 5, 10, 15$ and plot the data and the best cluster centers found in 10 000 trials.

   (b) K-means (on-line, competitive learning)
   - Experiment for $K = 5, 10$ and 15 clusters.
   - Plot the data and the final cluster centers.

   (c) Self-organizing map
   - Experiment for $K = 5, 10$ and 15 clusters.
   - Use Gaussian Kernel as the neighborhood function. Do not use an explicit neighborhood.
   - Plot the data and the final cluster centers.

   You can set parameter values freely for all three methods.

2. **Part II: SOM for the Euclidean Travelling Salesman Problem** (10 pts.)

   Your task is to determine a solution for the Euclidean Traveling Salesman Problem data given in the *"IE440Final19ETSP.txt"* using Self-organizing map

   - Solve the problem exactly on the given data set using a solver.
   - Experiment for $M = n$, $M = 2n$ and $M = 3n$, where M and n are respectively the number of neurons and cities.
   - Use first the Gaussian Kernel and as the neighborhood function. Then, the neighborhood function defined on the elastic band. Do not use an explicit neighborhood.
   - Compare the length of the tours obtained by your SOM application with the one of the optimal tour.
   - Plot the data and the final tours obtained with both neighborhood functions.

   You can set parameter values freely. Especially, you can keep increasing the number of neurons until the convergence occurs. The coordinates are in kilometers and intercity distances can be obtained by calculating the Euclidean distances.

For both parts of this question include the screen shots of your outputs and your source codes in your reports. Submit the soft copy of your report and the source code which are named as **FINAL19-SchoolID** to moodle before 16:00 PM, January 04 th, 2020.