Date: 28-04-2020 **Assignment # 02**

Section 17-A & B

Subject: Artificial Intelligence (AI)

Total Marks: 100

Deadline for submission is **16:00 PKT, Sunday 31st May, 2020**. Submit your assignment (Code) online on Slate.

Question # 01:

A traveling salesman has to travel through a bunch of cities, in such a way that the **expenses on traveling are minimized**; with the condition that each city is **visited only once**. This is the infamous Traveling Salesman Problem (aka TSP) problem. It is conjectured that all those problems require exponential time to solve them. In our case, this means that to find the optimal solution you have to go through all possible routes, and the number of routes increase exponentially with the numbers of cities.

If you want to get a notion of what numbers we are talking about look at this: the number of routes with 50 cities is (50-2)!, which is

12,413,915,592,536,072,670,862,289,047,373,375,038,521,486,354,677,760,000,000,000

Your objective in this assignment is to design and implement (in python) a software agent that solves the TSP problem using Genetic Algorithms (GAs). The input (perception) of the agent will be a 10x10 matrix (symmetric, as an example shown below), with each cell representing distances among cities as real values. The program takes as input a 10x10 matrix and searches in the solution space for optimal solution using GAs. In oral discussion, you have to justify your choice of chromosome representation, population size, crossover rate, mutation rate etc., as well you have to elaborate their effect on solution convergence.

	City1	**City2**	**City3**	**City4**	**City5**	**City6**	**City7**	**City8**	**City9**	**City10**
City1	0	66	21	300	500	26	77	69	125	650
City2		0	35	115	36	65	85	90	44	54
City3			0	450	448	846	910	47	11	145
City4				0	65	478	432	214	356	251
City5					0	258	143	325	125	39
City6						0	369	256	345	110
City7							0	45	120	289
City8								0	325	981
City9									0	326
City10										0

Good Luck!