Date: 7-06-2021 **Assignment # 02**

Section 18-A & B

Subject: Artificial Intelligence (AI)

Total Marks: 100

Deadline for submission is **16:00 PKT, Monday 14th June, 2021**. 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 (size of the state space) with 50 cities is (50-2)!, which is equal to

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. In addition, you have to elaborate their effect on solution convergence.

	City1	**City2**	**City3**	**City4**	**City5**	**City6**	**City7**	**City8**	**City9**	**City10**
City1	0	60	100	510	620	40	70	80	120	650
City2		0	60	130	40	80	90	90	440	540
City3			0	450	450	860	910	190	10	145
City4				0	70	1500	440	220	660	250
City5					0	260	160	330	120	50
City6						0	370	260	350	110
City7							0	50	120	270
City8								0	330	990
City9									0	330
City10										0

Good Luck!