**CS 401 - ARTIFICIAL INTELLIGENCE**

**Assignment 02**

**Deadline: 12th April 2019**

**Note:**

- Assignment is allowed to be done in a group of 2 students

- Your folder name to be uploaded on slate should be named as your id’s (eg. K16xxxx-k16yyyy)

Question 1) CSP

N-Queens problem: There is a n x n grid where the value of n is 8. Your task is to place 8 queens on this board. As per the rules of chess, a queen should have no other queen in its respective column, neither it should have any other queen in its row nor it should have any within its diagonal cells. You can consider this case as placing each queen individually per column such that it does not violate any of the constraints mentioned. It’s quite easy to find solution manually but your task is now to code it and find the correct positions for the queens.

This problem has to be solved through the concept of CSP. So initially you will place the first queen randomly at any location within column 1. With respect to its location, now next 7 queens’ domain might shrink up. This is where the concept of consistency will get applied. Further up, when we will move forward, there might be a point where domain gets empty for any particular queen, at that instance apply backtrack concept, which means that location of previous queen will have to get changed. You can use any other logic too involving CSP concept.

You are free to use any language. Comments your code where necessary to make it clean and clear.

Question 2) Genetic Algorithm

Genetic algorithm is random search case problem where we initialize some population and then using that we explore up iterations in order to find solution. For 8-Queen problem, take initial population of four in which each chromosome will be a string of 8 numbers ranging from 1-8. Initially the four populations can be made using random function. From that now choose a fitness function. One example of fitness function can be total number of conflicts value as per the rules of chess. Then by this fitness function we will always choose those chromosomes which have less value for the fitness function.

Next, after assigning any fitness function choose best 3 population based on the criteria. After this, cross over criteria is to be decided by your choice. You can choose any type of cross-over or any location from which two chromosomes have to be crossed. Declare the criteria in comments so as to make it understandable.

Decide mutation criteria now, as per correct logic we can mutate those bits who have repetitions for suppose if there is a particular chromosome produced after chromosome as 1245178 so 1 should be mutated as we cannot have same number for two different queens. Else you can go for random mutations.

Lastly there needs to be some criteria of when to stop. So for that, you can keep a threshold value for fitness function or a convergence point on how much maximum iterations the code should perform after which the answer with best fitness function gets presented.

You are free to use any language. Comments your code where necessary to make it clean and clear.