

Q1 – TSP

Individuals: A path containing all nodes only once.

Population: 30 individuals, randomly initialized (shuffle of non-repetitive nodes).

Fitness: Length of the path. If we have an unconnected node, it's path will have the length of infinity.

Selection: Best 4 individuals are selected as elites, as the next generations parents and children right away. Other parents are chosen randomly, based on their cumulative probability which is produced by the inverse of their fitness value.

Crossover: For each two parents, we have one child. We choose a substring from the first parent, and choose a substring from the second parent in a way that it doesn't contain the first parent's nodes. This is how we make the child.

Mutation: Two random nodes from two different paths are switched with a low probability of 10%

Algorithm halt: A fixed number of generations must pass in order to get the final result.

In the end, the path with no repetitive nodes and the least cost is returned.

Q2 – Equation

Each person is a number, x.

First, we initialize: population 100, roots from -10 till 10

Afterwards, we check the fitness of each of the members of the population by putting them as x in the equation. By sorting this list and getting the first member, we have our best candidate.

Crossover: Weighted average of sorted population as parents (in pairs). Each pair of parent results in two children with complementary weighted averages.

Child1 = $(R \cdot \text{parent1} + (10 - R) \cdot \text{parent2}) / 10$

Child2 = $(R \cdot \text{parent2} + (10 - R) \cdot \text{parent1}) / 10$

Mutation: Each individual is added or subtracted an amount of 0.1 with a low probability of 10%

Algorithm halt: When the best population passes the required threshold. (No generation is declared.)

In the end, the best candidate is returned.