

# CSE422 Artificial Intelligence

## Assignment 2

### Genetic Algorithms

Question 1:

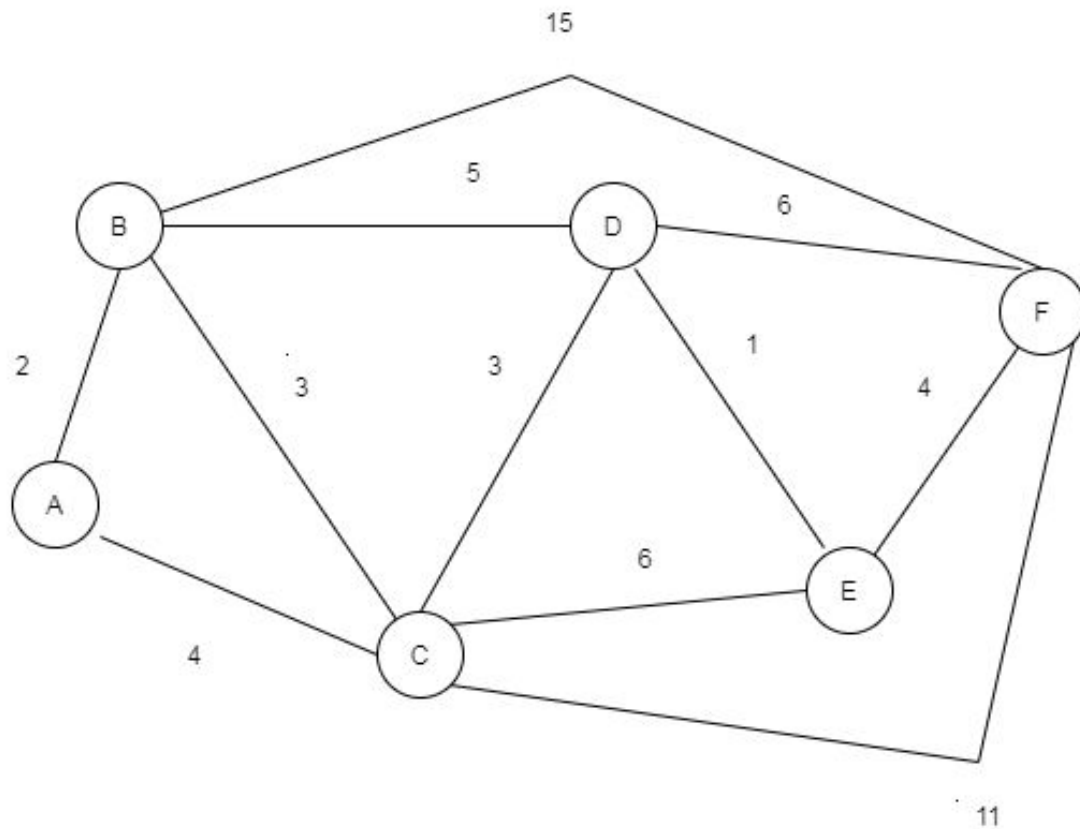
Object	Profit	Weight
A	10	2
B	5	3
C	15	5
D	7	7
E	6	1
F	18	4
G	10	8

Maximum weight = 15

The above problem is a 0/1 Knapsack problem. Here there are 7 different objects labelled from A to G. The objective of this problem is to carry the different objects in your bag in such a way such that the profit is maximized. But you have to make sure that your bag does not exceed the maximum weight. Remember you can carry an object exactly once. Now it is your job to use Genetic Algorithm so solve this problem and get the optimal answer.

1. Encode the problem and create an initial population of 4 different chromosomes
2. Perform natural selection to choose the fittest 2 chromosomes (think of an appropriate fitness function)
3. Perform a single point crossover to get 2 offspring
4. Perform mutation and check the fitness of the final offspring

Question 2:



Suppose you have been given a map of 6 cities connected with each other via different paths. Your job is to visit every city just once covering the minimum distance possible. Solve this problem using Genetic Algorithm. You can start at any point and end at any point. Just make sure that all the cities have been covered.

1. Encode the problem and create an initial population of 3 different chromosomes
2. Perform natural selection to choose the fittest 2 chromosomes (think of an appropriate fitness function)
3. Perform crossover to get 1 offspring. Are they eligible as a solution? Explain with reason.
4. Choose any one parent from your above solution and identify the following:

- i. Gene
- ii. Chromosome

Question 3:

Object	Profit	Weight
M	10	3
N	5	5
O	15	7
P	7	10
Q	6	2
R	3	1

Maximum weight = 21

The above problem is an optimization problem. Here there are 6 different objects labelled from M to R. The objective of this problem is to carry the different objects in your bag in such a way such that the profit is maximized. But you have to make sure that your bag does not exceed the maximum weight. Remember you can carry an object exactly once.

1. Do you think Genetic Algorithm is appropriate for solving this problem? Justify your answer
2. Encode the problem and create an initial population of 4 different chromosomes
3. Perform natural selection to choose the fittest 2 chromosomes (think of an appropriate fitness function)
4. Use the selected parent to create one offspring via crossover and mutation