1)

Trial1: 400

Trial2: 300

Trial3: 500

Average: 400

In this problem One max algorithm is used to generate a bit string that contains the maximum number of one which in this problem we want to generate a bit pattern of length 500 with a sum of 45.

In this program when we increase number of generations, we give program a greater number of rotation to improve the result: -

When I had 100 generation, the number of ones were 71 and when it was 400 the number of ones were 45 and so it was a better result, also when it was 300 the number of ones were 45.

The Optimal result was when we had 45 ones after running the program for particular amount of rotation by changing the value for generation.

2)

data = open("target\_map.txt", "r")

data = data.read()

count=0

for i in range(len(data)):

if data[i]=="#":

count=count+1

print(count)

Output:124

3)

a) In this program a robot controller is created which is used to move the robot in such a way that it hits the target which are “#” by either moving right, left, up and down.

It is using DEAP libraries and we used evolutionary programming to solve the problem. The problem was to traverse the map in such a way that the robot hits every target “#”.

b)

Trial 1: 99

Trial 2: 111

Trail 3: 82

Average: 97.33

c)

Experiment 1: Population Size:400 Crossover Prob:0.2 Mutation Prob:0.3

Trial 1: 92

Trial 2: 96

Trial 3: 79

Average: 89

Experiment 2: Population Size:400 Crossover Prob:0.4 Mutation Prob:0.7

Trial 1: 80

Trial 2: 96

Trial 3: 100

Average: 92

Experiment 3: Experiment 2: Population Size:400 Crossover Prob:0.7 Mutation Prob:0.7

Trial 1: 88

Trial 2: 95

Trial 3: 88

Average: 90.33

Experiment 4: Experiment 2: Population Size:500 Crossover Prob:0.4 Mutation Prob:0.3

Trial 1: 98

Trial 2: 98

Trial 3: 100

Average: 98.66