

PROGRAM-19

SIMULATED ANNEALING ALGORITHM PROBLEM

AIM:-

To write and execute the python program for the Simulated annealing algorithm program.

PROCEDURE:-

Imports and Setup:

- Import the required libraries: math and random.

Simulated Annealing Function:

- Define the simulated annealing algorithm function.

Define Cost Function:

- Define the cost function. In this case, it's the Rastrigin function simplified to 1D.

Set Initial Parameters:

- Set the initial temperature and cooling rate.

Execution and Output:

- Execute the simulated annealing function with the defined parameters.
- Print the optimum state found.

CODING:-

```
import math, random

def simulated_annealing(cost_func, start_temp, cooling_rate):

    state = current = random.uniform(-10, 10)

    temp = start_temp

    while temp > 0.001:

        new_state = current + random.uniform(-1, 1)

        cost_diff = cost_func(new_state) - cost_func(current)

        if cost_diff < 0 or math.exp(-cost_diff / temp) > random.random():
```

```
state = new_state

current = new_state

temp *= cooling_rate

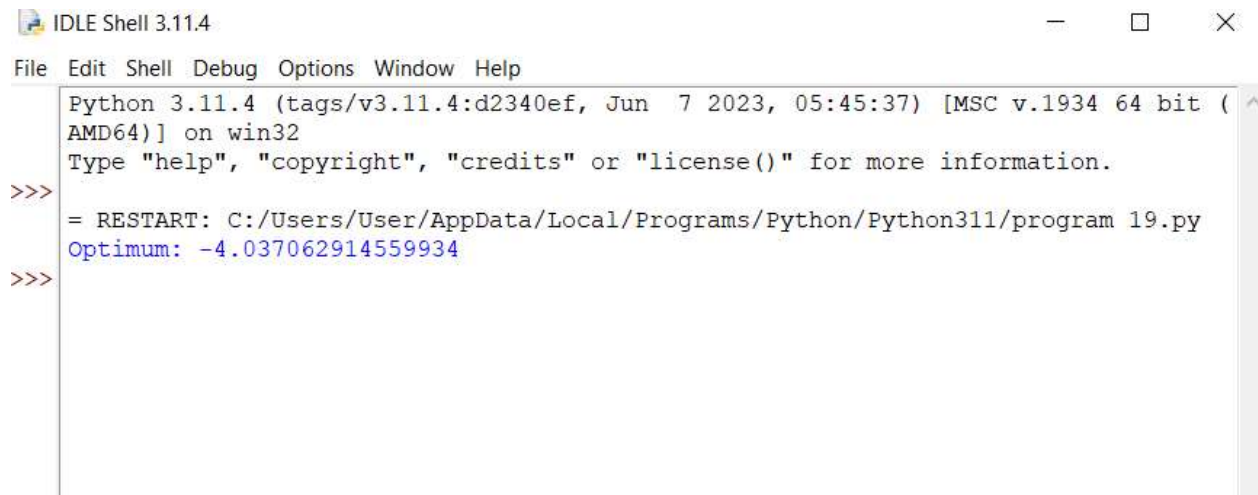
return state

cost_func = lambda x: (x ** 2) - (10 * math.cos(2 * math.pi * x)) + 10 # Rastrigin
function simplified to 1D

start_temp, cooling_rate = 1000, 0.98

print("Optimum:", simulated_annealing(cost_func, start_temp, cooling_rate))
```

OUTPUT:-



```
IDLE Shell 3.11.4
File Edit Shell Debug Options Window Help
Python 3.11.4 (tags/v3.11.4:d2340ef, Jun 7 2023, 05:45:37) [MSC v.1934 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/User/AppData/Local/Programs/Python/Python311/program 19.py
Optimum: -4.037062914559934
>>>
```

RESULT:-

Hence the program has been successfully executed and verified.