NAME: WASIT SHAFI ROLL No: 18MCA054 Date: 03-SEP-2020

Q1. Implement Monte Carlo method to find value of pi.

Sol.

```
from math import pi
from random import uniform

count = 0
ITERATIONS = 1000000

for i in range(ITERATIONS):
        x = uniform(-1, 1)
        y = uniform(-1, 1)
        if (x ** 2 + y ** 2) <= 1:
                count += 1

estimation = 4 * count / ITERATIONS
print("Estimation value of PI is : ", estimation)
print("Actaual value of PI is    : ", pi)
print("Error : ", pi - estimation)
```

OUTPUT :

```
(base) wasitshafi@wasitspc:~$ python -u "/home/wasitshafi/Desktop/ModellingAndSimulation(MontiCarloMethod)/EstimationOfPi.py"
Estimation value of PI is :  3.140108
Actaual value of PI is    :  3.141592653589793
Error :  0.0014846535897929947
(base) wasitshafi@wasitspc:~$
```

Q2. Implement Monte Carlo method to find value of sqrt(2) and sqrt(5).

Sol.

 # Program for sqrt(2)

```
from math import sqrt
from random import uniform

NUM = 2
ITERATIONS = 10000000
ITERATIONS = 100000
EPS = .0000000001 # Epsilon
count = 0

for i in range(ITERATIONS):
   if (uniform(0 + EPS, NUM - EPS) ** 2) <= NUM: # 0 < uniform(0 + EPS, NUM - EPS) < NUM
      count += 1

estimation = ITERATIONS / count
sqrt_num = sqrt(NUM)

print('Estimation of sqrt(', NUM, ') is   : ', estimation, sep = '')
print('Actual Value of sqrt(', NUM, ') is : ', sqrt_num, sep = '')
print('Error :', sqrt_num – estimation)
```

OUTPUT :

```
(base) wasitshafi@wasitspc:~$ python -u "/home/wasitshafi/Desktop/ModellingAndSimulation(MontiCarloMethod)/tempCodeRunnerFile.py"
Estimation of sqrt(2) is   : 1.4174545351457852
Actual Value of sqrt(2) is : 1.4142135623730951
Error : -0.003240972772690087
(base) wasitshafi@wasitspc:~$
```

 # Program for sqrt(5)

```
from math import sqrt
from random import uniform

NUM = 5
ITERATIONS = 10000000
ITERATIONS = 100000
EPS = .0000000001 # Epsilon
count = 0

for i in range(ITERATIONS):
    if (uniform(0 + EPS, NUM - EPS) ** 2) <= NUM: # 0 < uniform(0 + EPS, NUM - EPS) < NUM
        count += 1

estimation = ITERATIONS / count
sqrt_num = sqrt(NUM)

print('Estimation of sqrt(', NUM, ') is   : ', estimation, sep = '')
print('Actual Value of sqrt(', NUM, ') is : ', sqrt_num, sep = '')
print('Error :', sqrt_num – estimation)
```

OUTPUT:

```
(base) wasitshafi@wasitspc:~$ python -u "/home/wasitshafi/Desktop/ModellingAndSimulation(MontiCarloMethod)/tempCodeRunnerFile.py"
Estimation of sqrt(5) is   : 2.249162187085311
Actual Value of sqrt(5) is : 2.23606797749979
Error : -0.0130942095855211
(base) wasitshafi@wasitspc:~$
```