Cryptography & Network Security

PRN - 2019BTECS00026

Name - Niraja Vasudev Kulkarni

Batch - B1

Assignment - 8

<u>Title</u>: Euclidean and Extended Euclidean Algorithm

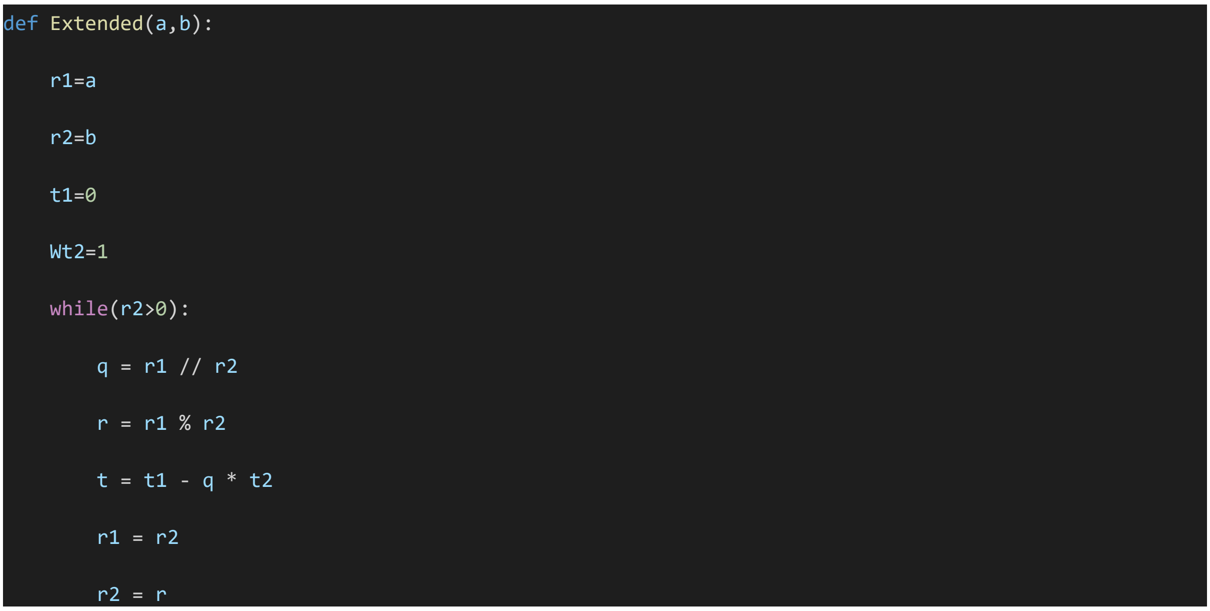
<u>Aim</u>: To Demonstrate Euclidean and Extended Euclidean Algorithm

<u>Theory</u>:

In mathematics, the Euclidean algorithm, or Euclid's algorithm, is an efficient method for computing the greatest common divisor (GCD) of two integers (numbers), the largest number that divides them both without a remainder.

The extended Euclidean algorithm is particularly useful when a and b are coprime. With that provision, x is the modular multiplicative inverse of a modulo b, and y is the modular multiplicative inverse of b modulo a.

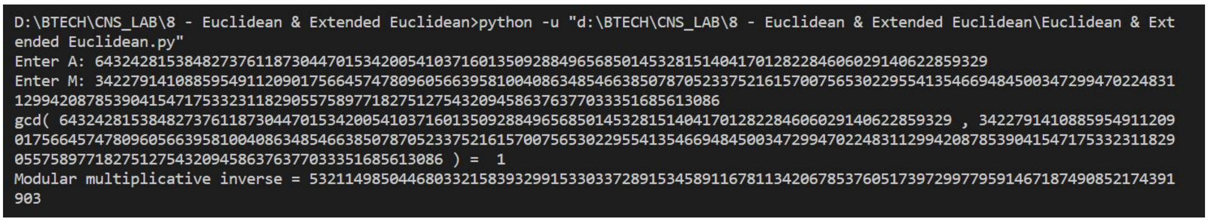
<u>Code</u>:



```
def Extended(a,b):

    r1=a

    r2=b

    t1=0

    Wt2=1

    while(r2>0):

        q = r1 // r2

        r = r1 % r2

        t = t1 - q * t2

        r1 = r2

        r2 = r
        t1 = t2

        t2 = t



    if(t1<0):

        return t1+a


    return t1
```

```
a= int(input("Enter number M: "))

b= int(input("Enter number A: "))

inverse = Extended(a,b)

print("Multiplicative modular inverse - %d" %(inverse))

# A =
6432428153848273761187304470153420054103716013509288496568501453281514041701282284606029140622859329

# X =
5321149850446803321583932991533033728915345891167811342067853760517397299779591467187490852174391903

# M =
342279141088595491120901756645747809605663958100408634854663850787052337521615700756530229554135466948
45003472994702248311299420878539041547175332311829055758977182751275432094586376377033351685613086
```

Output:



```
D:\BTECH\CNS_LAB\8 - Euclidean & Extended Euclidean>python -u "d:\BTECH\CNS_LAB\8 - Euclidean & Extended Euclidean\Euclidean & Ext
ended Euclidean.py"
Enter A: 6432428153848273761187304470153420054103716013509288496568501453281514041701282284606029140622859329
Enter M: 3422791410885954911209017566457478096056639581004086348546638507870523375216157007565302295541354669484500347299470224831
1299420878539041547175332311829055758977182751275432094586376377033351685613086
gcd( 6432428153848273761187304470153420054103716013509288496568501453281514041701282284606029140622859329 , 3422791410885954911209
0175664574780960566395810040863485466385078705233752161570075653022955413546694845003472994702248311299420878539041547175332311829
055758977182751275432094586376377033351685613086 ) =  1
Modular multiplicative inverse = 5321149850446803321583932991533033728915345891167811342067853760517397299779591467187490852174391
903
```

Conclusion:

The Euclidean and Extended Euclidean algorithm are used to find the GCD of numbers and the Multiplicative inverse of two coprime numbers respectively.