Ex. No. 6	IMPLEMENT THE SIGNATURE SCHEME – DIGITAL SIGNATURE STANDARD
Date of Exercise	.2024

Aim

To write a Python program to implement the signature scheme named digital signature standard (Euclidean Algorithm).

Description

Standardization: DSS is a U.S. federal standard for digital signatures, defined in FIPS 186, which specifies the Digital Signature Algorithm (DSA) as its main method for creating digital signatures.

Hash and Signing: It combines a cryptographic hash function (like SHA-1, SHA-256) and DSA, RSA, or ECDSA to generate a signature based on the message's hash, ensuring message integrity and authenticity.

Public Key Infrastructure (PKI): DSS is based on asymmetric encryption, utilizing a public-private key pair for verification and signing, with the public key shared openly while the private key remains confidential.

ALGORITHM

STEP 1: Alice and Bob are investigating a forgery case of x and y.

STEP 2: X had a document signed by him but says he did not sign that document digitally.

STEP 3: Alice reads the two prime numbers p and a.

STEP 4: He chooses a random co-prime alpha, beta, and the x's original signature x.

STEP 5: With these values, he applies it to the elliptic curve cryptographic equation to obtain y.

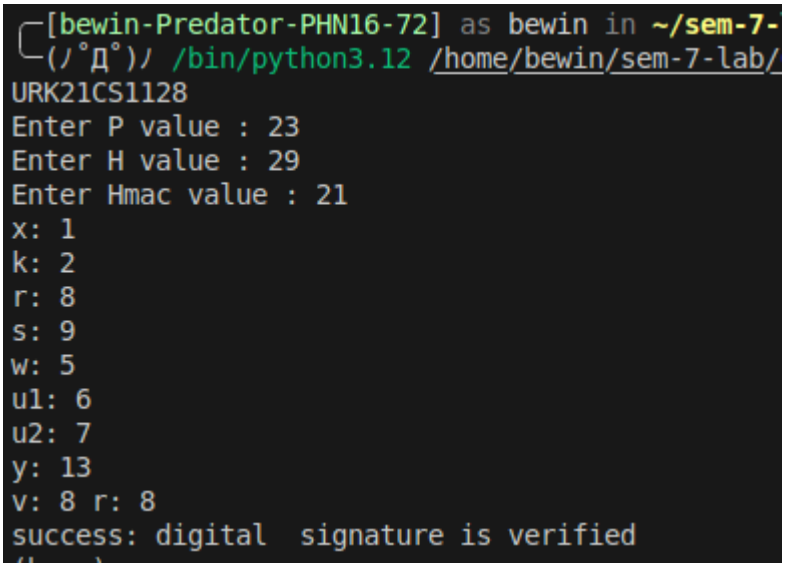
STEP 6: Comparing this 'y' with the actual y's document, Alice concludes that y is a forgery.

Program

```
print("URK21CS1128")
from math import gcd
p = int(input("Enter p value: "))
h = int(input("Enter H value: "))
Hmac = int(input("Enter Hmac value: "))
k, q, s, w, r = 0, 0, 0, 0, 0
for Q in range(p//2, 0, -1):
    if(p-1) % Q == 0:
        for j in range(2, Q//2+1):
            if Q % j == 0:
                break
        else:
            q = Q
    if q != 0:
        break
g = (h ** ((p-1)//q)) % p
x = 1
print("x: ",x)
for k in range(2,q):
    if gcd(k,q) == 1:
```

```
r = (pow(g,k,p))%q
s = (pow(k,-1,q) * (Hmac + (r*x))) % q
if gcd(s,q) == 1:
    print(f"k:{k}")
    print(f"r:{r}")
    print(f"s:{s}")
    w = pow(s,-1,q)
    print(f"w:{w}")
    u1 = (Hmac * w) % q
    u2 = (r*w)% q
    print(f"u1:{u1}")
    print(f"u2: {u2}")
    y = pow(g,x,p)
    print(f"y:{y}")
    v = (pow(g,u1,p) * pow(y,u2,p))% p % q
    print(f"v: {v},r:{r}")
    if v == r:
        print("\n Success digital signature is verified")
    break
```

Output Screenshot



Result

The program has executed successfully and the output is displayed in the console.