Sipna College of Engineering & Technology, Amravati.
Department of Computer Science & Engineering

Branch :- Computer Sci. & Engg. **Class :- Final Year**
Subject :-Block Chain Fundamentals Lab manual **Sem :- VII**

Teacher Manual

PRACTICAL NO 2

AIM: Implement Diffie-Hellman Algorithm

S/W REQUIRED: Phython

Diffie-Hellman algorithm

The Diffie-Hellman algorithm is being used to establish a shared secret that can be used for secret communications while exchanging data over a public network using the elliptic curve to generate points and get the secret key using the parameters.

For the sake of simplicity and practical implementation of the algorithm, we will consider only 4 variables, one prime P and G (a primitive root of P) and two private values a and b.
P and G are both publicly available numbers. Users (say Alice and Bob) pick private values a and b and they generate a key and exchange it publicly. The opposite person receives the key and that generates a secret key, after which they have the same secret key to encrypt.

Step by Step Explanation

Alice	Bob
Public Keys available = P, G	Public Keys available = P, G
Private Key Selected = a	Private Key Selected = b
Key generated = $x=G^a \bmod P$	Key generated = $y=G^b \bmod P$
Exchange of generated keys takes place	
Key received = y	key received = x
Generated Secret Key = $K_a=y^a \bmod P$	Generated Secret Key = $K_b=x^b \bmod P$

Alice	Bob
Algebraically, it can be shown that $K_a=K_b$	
Users now have a symmetric secret key to encrypt	

Example:

Step 1: Alice and Bob get public numbers P = 23, G = 9

Step 2: Alice selected a private key a = 4 and
Bob selected a private key b = 3

Step 3: Alice and Bob compute public values
Alice: x =(9^4 mod 23) = (6561 mod 23) = 6
Bob: y = (9^3 mod 23) = (729 mod 23) = 16

Step 4: Alice and Bob exchange public numbers

Step 5: Alice receives public key y =16 and
Bob receives public key x = 6

Step 6: Alice and Bob compute symmetric keys
Alice: ka = y^a mod p = 65536 mod 23 = 9
Bob: kb = x^b mod p = 216 mod 23 = 9

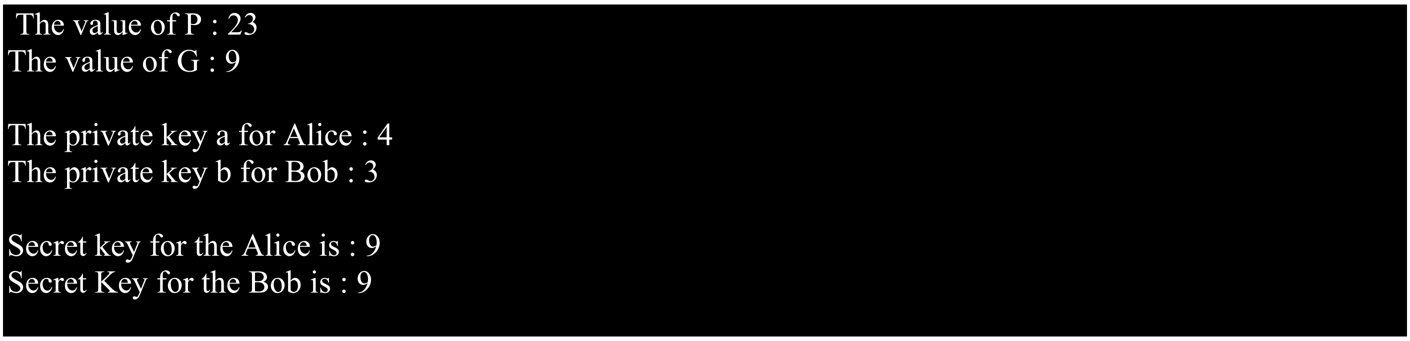
Step 7: 9 is the shared secret.

Implementation:

```
from random import randint

if __name__ == '__main__':

        # Both the persons will be agreed upon the
        # public keys G and P
        # A prime number P is taken
        P = 23

        # A primitive root for P, G is taken
        G = 9


        print('The Value of P is :%d'%(P))
        print('The Value of G is :%d'%(G))
```

```
# Alice will choose the private key a
a = 4
print('The Private Key a for Alice is :%d'%(a))

# gets the generated key
x = int(pow(G,a,P))

# Bob will choose the private key b
b = 3
print('The Private Key b for Bob is :%d'%(b))

# gets the generated key
y = int(pow(G,b,P))


# Secret key for Alice
ka = int(pow(y,a,P))

# Secret key for Bob
kb = int(pow(x,b,P))

print('Secret key for the Alice is : %d'%(ka))
print('Secret Key for the Bob is : %d'%(kb))
```

Output:



```
 The value of P : 23
The value of G : 9

The private key a for Alice : 4
The private key b for Bob : 3

Secret key for the Alice is : 9
Secret Key for the Bob is : 9
```

CONCLUSION: Thus we have implemented a Diffie-Hellman Algorithm.