EXP NO:5
DATE:

DIFFIE-HELLMAN KEY EXCHANGE

AIM:

To implement Diffie-Hellman key exchange using C.

ALGORITHM:

Step 1: Choose a large prime number P and a primitive root modulo (P), denoted as (G). Both parties agree on these values.

Step 2: Alice chooses a private key (a), while Bob chooses a private key (b). These private keys are kept secret.

Step 3: Alice calculates her public key (x) using ($x = G^a \bmod P$), and Bob calculates his public key (y) using ($y = G^b \bmod P$).

Step 4: Alice sends her public key (x) to Bob, and Bob sends his public key (y) to Alice.

Step 5: Using the received public keys, Alice computes the secret key (ka) using ($ka = y^a \bmod P$), and Bob computes the secret key (kb) using ($kb = x^b \bmod P$).

Step 6: Both Alice and Bob now have the same shared secret key.

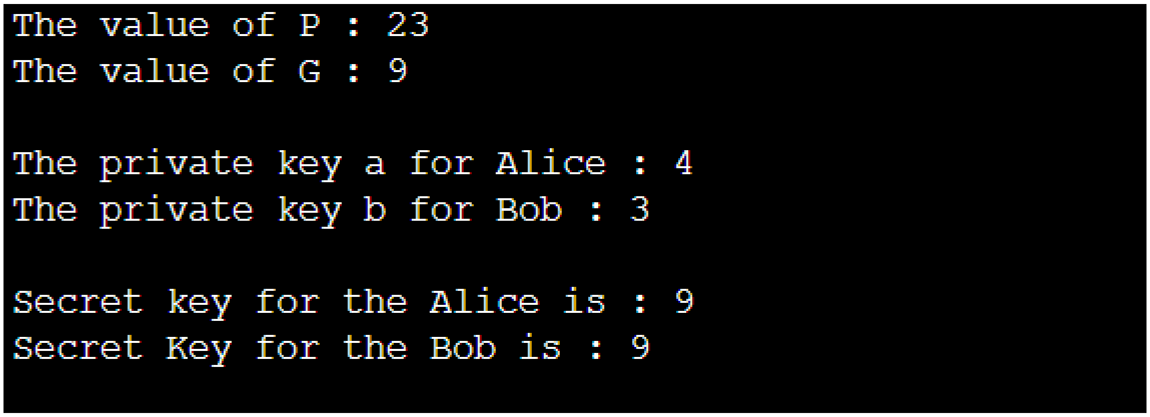
Step 7: They can now communicate securely using the shared secret key for encryption and decryption.

Step 8: The security of the Diffie-Hellman Key Exchange relies on the difficulty of calculating discrete logarithms in finite fields.

PROGRAM:

```
#include <math.h>
#include <stdio.h>
long long int power(long long int a, long long int b,long long int P)
{
        if (b == 1)
                return a;
        else
                return (((long long int)pow(a, b)) % P);
}
int main()
{
        long long int P, G, x, a, y, b, ka, kb;
        P = 23;
        printf("The value of P : %lld\n", P);
        G = 9;
        printf("The value of G : %lld\n\n", G);
        a = 4;
        printf("The private key a for Alice : %lld\n", a);
        x = power(G, a, P);
        b = 3;
        printf("The private key b for Bob : %lld\n\n", b);
        y = power(G, b, P);
        ka = power(y, a, P);
        kb = power(x, b, P);
        printf("Secret key for the Alice is : %lld\n", ka);
        printf("Secret Key for the Bob is : %lld\n", kb);
        return 0;
}
```

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
```

RESULT: