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 mod P), and Bob calculates his public key (y) using (y = G^b mod 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 mod P), and Bob computes the secret key (kb) using (kb = x^b mod 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.

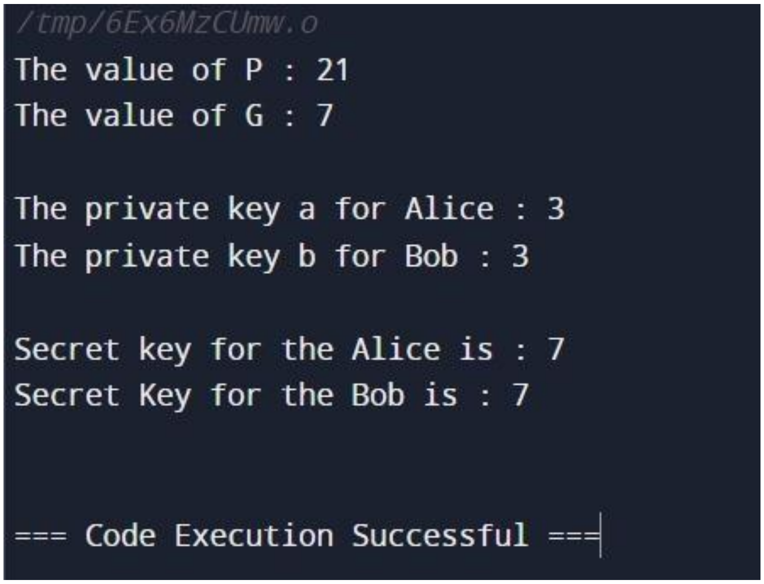
Program:

```
#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:



```
/tmp/6Ex6MzCUmw.o
The value of P : 21
The value of G : 7

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

Secret key for the Alice is : 7
Secret Key for the Bob is : 7


=== Code Execution Successful ===
```

Result: