EXP NO:5 **DATE: 24/02/24**

DIFFIE-HELLMAN KEY EXCHANGE

Aim: To implement Diffie-Hellman key exchange using C.

Algorithm:

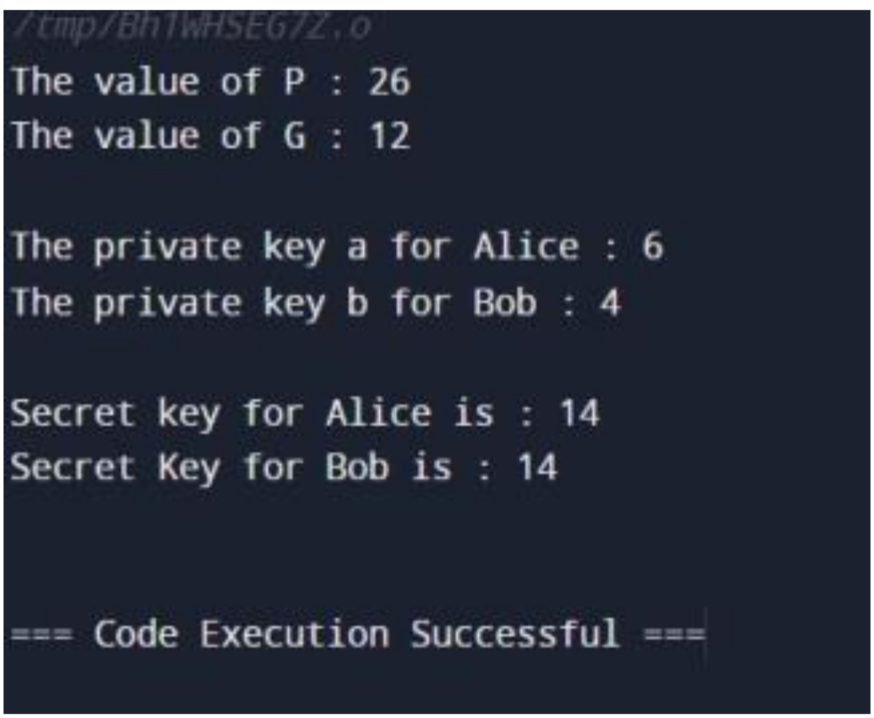
- Step 1: Choose a large prime number P and a primitive root modulo (P), denoted as (G). Both parties agree on these values. ● Step 2: Alice chooses a private key (a), while Bob chooses a private key (b). These private keys are kept secret.
- Step 3: Alice calculates her public key (x) using (x = G^a 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 = 26;
 printf("The value of P : %lld\n", P);
G = 12;
```

```
printf("The value of G : %lld\n\n", G);
a = 6;
printf("The private key a for Alice : %lld\n", a);
x = power(G, a, P);

b = 4;
 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 Alice is : %lld\n", ka);
printf("Secret Key for Bob is : %lld\n", kb);

 return 0;
}
```

Output:



Result:

Thus the Diffie-Hellman key exchange using C is implemented successfully.