EXP NO: 3
DATE: 09/03/24

DIGITAL SIGNATURE ALGORITHM

AIM:

To implement Digital Signature Algorithm (DSA) using C.

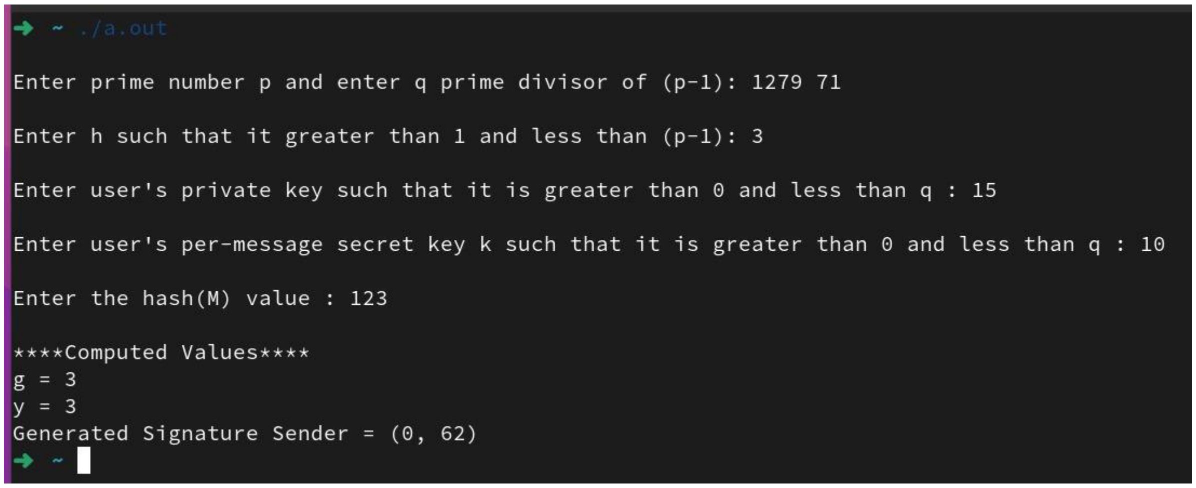
ALGORITHM:

1. Get the prime number p and its divisor q from the user.
2. Get the value of h from the user.
3. Compute the value of g.
4. Get the private key xa from the user.
5. Compute the user's public key y.
6. Get the per-message secret key k and hash value of message M.
7. Compute the value of z using g, k & p
8. Compute z % q to get the value of r
9. Compute the multiplicative inverse. 10.Compute the value of s.
10. Print the signature (r, s).

PROGRAM:

```
#include <stdio.h> #include <math.h>
int power(int,unsigned int,int);
int multiplicativeInverse(int,int,int); int main()
{
int p,q,h,g,r,s,t,x,y,z,k,inv,hash;
printf("\nEnter prime number p and enter q prime divisor of (p-1): ");
scanf("%d %d",&p,&q);
printf("\nEnter h such that it greater than 1 and less than (p-1): ");
scanf("%d",&h);
//Compute g t = (p-1)/q;
g = power(h,t,p);
printf("\nEnter user's private key such that it is greater than 0 and less than q : "); scanf("%d",&x);
//Computer user's public key
y = power(g,x,p);
printf("\nEnter user's per-message secret key k such that it is greater than 0 and less than q : ");
scanf("%d",&k);
printf("\nEnter the hash(M) value : "); scanf("%d",&hash);
//Signing. Compute r and s pair z = power(g,k,p);
r = z % q;
inv = multiplicativeInverse(k,q,p); s = inv * (hash + x * r) % q;
//Display
printf("\n*********Computed Values*********"); printf("\ng = %d",g);
printf("\ny = %d",y);
printf("\nGenerated Signature Sender = (%d, %d) \n",r,s);
}
int power(int x, unsigned int y, int p)
{
int res = 1; // Initialize result
x = x % p; // Update x if it is more than or equal to p while (y > 0)
{
// If y is odd, multiply x with result if (y & 1)
res = (res * x) % p;
// y must be even now y = y >> 1; // y = y/2 x = (x * x) % p;
}
return res;
}
int multiplicativeInverse(int a, int b, int n)
{
int sum,x,y; for(y=0;y<n;y++)
{
for(x=0;x<n;x++)
{
sum = a * x + b * (-y); if(sum == 1)
return x;
}
}
}
```

OUTPUT:



```
➜ ~ ./a.out

Enter prime number p and enter q prime divisor of (p-1): 1279 71

Enter h such that it greater than 1 and less than (p-1): 3

Enter user's private key such that it is greater than 0 and less than q : 15

Enter user's per-message secret key k such that it is greater than 0 and less than q : 10

Enter the hash(M) value : 123

****Computed Values****
g = 3
y = 3
Generated Signature Sender = (0, 62)
➜ ~
```

RESULT:

Thus, a C program is implemented to demonstrate Digital Signature Algorithm.