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;
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.