

EXP NO:6

DATE:15/03/2024

DSA

Aim:To implement Digital Signature Algorithm (DSA) using C.

Algorithm:

- Step 1: Include the necessary header files `#include <stdio.h>` and `#include <math.h>`.
- Step 2: Declare the required variables for the program, including integers for prime numbers, private keys, hash value, and computed values like gg , rr , and ss .
- Step 3: Prompt the user to enter the prime number pp and the prime divisor qq of $(p-1)$ ($p-1$). Also, prompt the user to enter hh such that it's greater than 1 and less than $(p-1)(p-1)$.
- Step 4: Calculate gg using the function `power(h,t,p)`.
- Step 5: Prompt the user to enter their private key xx and per-message secret key kk . Also, prompt the user to enter the hash value MM .
- Step 6: Compute rr and ss values for the signature using the provided formulas.
- Step 7: Print the computed values of gg , yy , rr , and ss .
- Step 8: Define the power function to calculate the power of a number modulo pp .
- Step 9: Define the `multiplicativeInverse` function to find the multiplicative inverse of a number modulo nn .

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); 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);
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);
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; x = x
% p; { res = (res
* 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:

```
Enter prime number p and enter q prime divisor of (p-1): 7  
7  
  
Enter h such that it greater than 1 and less than (p-1): 8  
  
Enter user's private key such that it is greater than 0 and less than q : 4  
  
Enter user's per-message secret key k such that it is greater than 0 and less than q : 2  
  
Enter the hash(M) value : 1  
  
*****Computed Values*****  
g = 1  
y = 0  
Generated Signature Sender = (0, 4)  
  
...Program finished with exit code 0  
Press ENTER to exit console.[]
```

Result:

The digital signature algorithm has been successfully executed using C.