**Ex.No. : 3** **DIGITAL SIGNATURE SCHEME**
**Date :**

**AIM:**

To implement the signature scheme - Digital Signature Standard.

**ALGORITHM:**

1. Declare the class and required variables.
2. Create the object for the class in the main program.
3. Access the member functions using the objects.
4. Implement the SIGNATURE SCHEME - Digital Signature Standard.
5. It uses a hash function.
6. The hash code is provided as input to a signature function along with a random number K generated for the particular signature.
7. The signature function also depends on the sender„s private key.
8. The signature consists of two components.
9. The hash code of the incoming message is generated.
10. The hash code and signature are given as input to a verification function.

**PROGRAM:**

```
import java.util.*;
import java.math.BigInteger;
class dsaAlg {
final static BigInteger one = new BigInteger("1");
final static BigInteger zero = new BigInteger("0");
public static BigInteger getNextPrime(String ans)
{
BigInteger test = new BigInteger(ans);
while (!test.isProbablePrime(99))
e:
{
test = test.add(one);
}
return test;
}
public static BigInteger findQ(BigInteger n)
{
BigInteger start = new BigInteger("2");
while (!n.isProbablePrime(99))
{
while (!((n.mod(start)).equals(zero)))
{
start = start.add(one);
}
n = n.divide(start);
}
return n;
}
```

```
public static BigInteger getGen(BigInteger p, BigInteger q,
Random r)
{
BigInteger h = new BigInteger(p.bitLength(), r);
h = h.mod(p);
return h.modPow((p.subtract(one)).divide(q), p);
}
public static void main (String[] args) throws
java.lang.Exception
{
Random randObj = new Random();
BigInteger p = getNextPrime("10600"); /* approximate
prime */
BigInteger q = findQ(p.subtract(one));
BigInteger  g = getGen(p,q,randObj);
System.out.println(" \n simulation of Digital Signature Algorithm \n");
System.out.println(" \n global public key components are:\n");
System.out.println("\np is: " + p);
System.out.println("\nq is: " + q);
System.out.println("\ng is: " + g);
BigInteger x = new BigInteger(q.bitLength(), randObj);
x = x.mod(q);
BigInteger  y = g.modPow(x,p);
BigInteger k = new BigInteger(q.bitLength(), randObj);
k = k.mod(q);
BigInteger r = (g.modPow(k,p)).mod(q);
BigInteger hashVal = new BigInteger(p.bitLength(),
randObj);
BigInteger kInv = k.modInverse(q);
BigInteger s = kInv.multiply(hashVal.add(x.multiply(r)));
s = s.mod(q);
System.out.println("\nsecret information are:\n");
System.out.println("x (private) is:" + x);
System.out.println("k (secret) is: " + k);
System.out.println("y (public) is: " + y);
System.out.println("h (rndhash) is: " + hashVal);
System.out.println("\n generating digital signature:\n");
System.out.println("r is : " + r);
System.out.println("s is : " + s);
BigInteger  w = s.modInverse(q);
BigInteger u1 = (hashVal.multiply(w)).mod(q);
BigInteger  u2 = (r.multiply(w)).mod(q);
BigInteger v = (g.modPow(u1,p)).multiply(y.modPow(u2,p));
v = (v.mod(p)).mod(q);
System.out.println("\nverifying digital signature (checkpoints)\n:");
System.out.println("w is : " + w);
System.out.println("u1 is : " + u1);
System.out.println("u2 is : " + u2);
System.out.println("v is : " + v);
if (v.equals(r))
{
System.out.println("\nsuccess: digital signature is verified!\n " + r);
}
else
{
System.out.println("\n error: incorrect digital signature\n ");
}
}
}
```

**OUTPUT:**

```
C:\Security Lab New\programs>javac dsaAlg.java
C:\Security Lab New\programs>java dsaAlg
simulation of Digital Signature Algorithm
global public key components are:
p is: 10601
q is: 53
g is: 6089
secret information are:
x (private) is:6k
(secret) is: 3
y (public) is: 1356
h (rndhash) is: 12619 generating
digital signature:
r is : 2s is :
41
verifying digital signature (checkpoints):
w is : 22 u1 is
: 4 u2 is : 44v
is : 2
success: digital signature is verified!2
```

**RESULT:**

Thus the Digital Signature Standard Signature Scheme has been implemented and executed successfully.