EXP NO:4

DATE:

RSA

Aim:

To implement an encryption algorithm using RSA.

Algorithm:

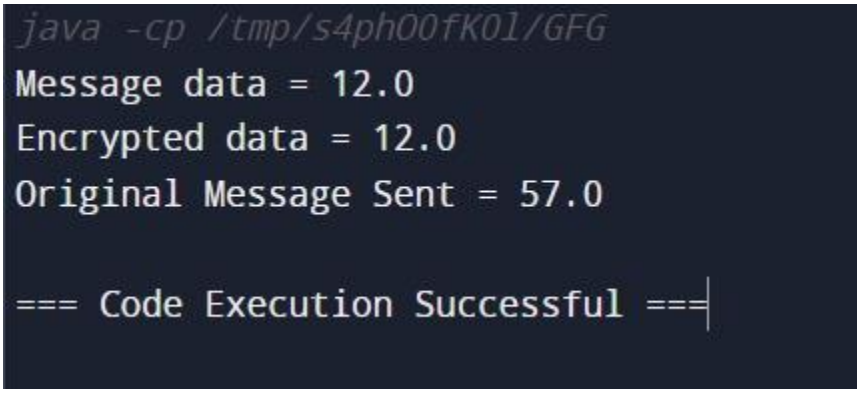
- Step 1: Select two large prime numbers, p and q.
- Step 2: Calculate the modulus, n = p * q.
- Step 3: Compute Euler's totient function, φ(n) = (p - 1) * (q - 1). ● Step 4: Choose a public exponent, e, such that 1 < e < φ(n) and gcd(e, φ(n)) = 1.
- Step 5: Compute the private exponent, d, such that (d * e) mod φ(n) = 1. ● Step 6: Convert the plaintext message into a numerical representation, usually using ASCII values or Unicode.
- Step 7: Encrypt the message by computing ciphertext, c, using the formula c = (msg^e) mod n.
- Step 8: Print the encrypted data.
- Step 9: Decrypt the ciphertext by computing the original message, m, using the formula m = (c^d) mod n.
- Step 10: Print the original message.
- Step 11: Return 0 for successful execution and program termination.

Program:

```
import java.io.*;
import java.math.*;
import java.util.*;
public class GFG {
        public static double gcd(double a, double h)
        {
                double temp;
                while (true) {
                        temp = a % h;
                        if (temp == 0)
                                return h;

                        a = h;
```

```
                h = temp;
            }
        }
        public static void main(String[] args)
        {
            double p = 9;
            double q = 5;

            double n = p * q;


            double e = 2;
            double phi = (p - 1) * (q - 1);
            while (e < phi) {

                if (gcd(e, phi) == 1)
                    break;
                else
                    e++;
            }
            int k = 2;
            double d = (1 + (k * phi)) / e;


            double msg = 12;

            System.out.println("Message data = " + msg);


            double c = Math.pow(msg, e);
            c = c % n;
            System.out.println("Encrypted data = " + c);
double m = Math.pow(c, d);
m = m % n;
System.out.println("Original Message Sent = " + m);
}
}
```

Output:



Result: