EXP NO:4 **DATE:**

RSA

Aim : To implement an encryption algorithm using Rsa.

Algorithm:

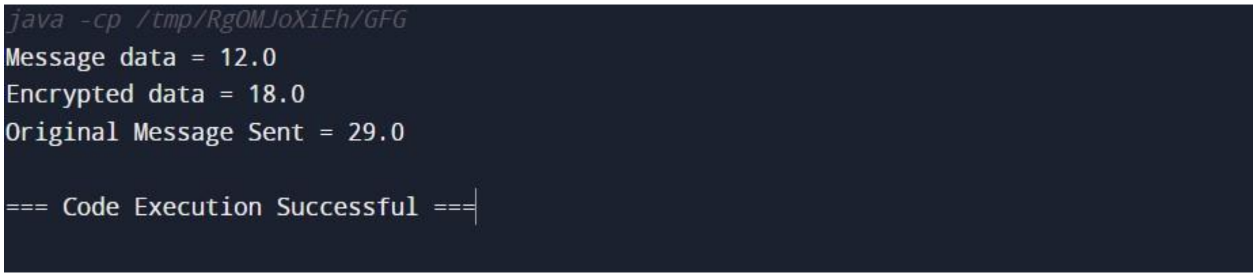
- Step 1: Select two large prime numbers, p and q. ● Step 2: Calculate the modulus, n = p * q.
- Step 3: Compute Euler's totient function, φ(n) = (p - 1) * (q - 1).
- Step 4: Choose a public exponent, e, such that 1 < e < φ(n) and gcd(e, φ(n)) =
  1.
- Step 5: Compute the private exponent, d, such that (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:



```
java -cp /tmp/RgOMJoXiEh/GFG
Message data = 12.0
Encrypted data = 18.0
Original Message Sent = 29.0

=== Code Execution Successful ===
```

Result: