EXP NO:4 **DATE: 17/02/24**

RSA

Aim: To implement an encryption algorithm using Rsa.

Algorithm:

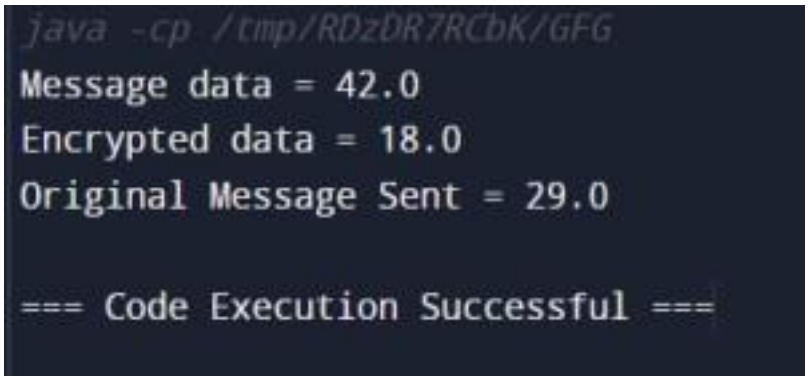
- Step 1: Select two large prime numbers, p and q.
- Step 2: Calculate the modulus, n = p * q.
- Step 3: Compute Euler's totient function, φ(n) = (p - 1) * (q - 1). ● Step 4: Choose a public exponent, e, such that 1 < e < φ(n) and gcd(e, φ(n)) = 1.
- Step 5: Compute the private exponent, d, such that (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 = 42;

 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:

Thus the encryption algorithm using RSA is implemented successfully.