EX.NO: ROLL.NO: 210701278

DATE:

Implement the RSA Algorithm

AIM:

To implement RSA technique on the user input message.

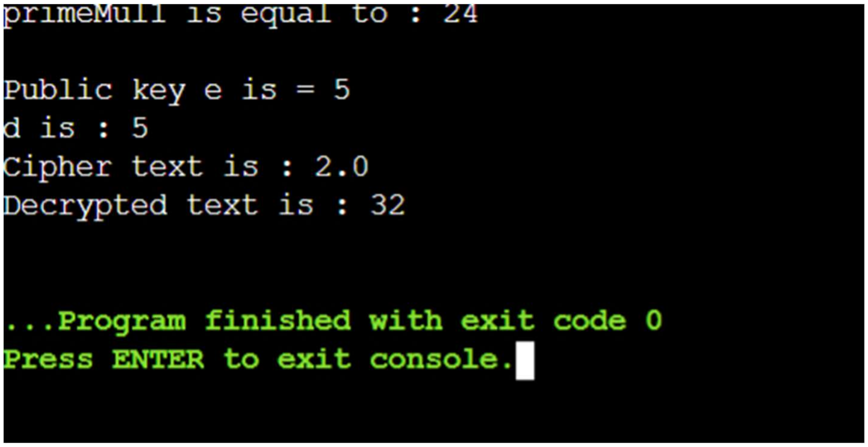
ALGORITHM:

1. Select two large prime numbers p and q and compute n = p * q and φ(n) = (p - 1) * (q - 1).
2. Choose a public exponent e coprime to φ(n) and calculate the private exponent d such that d * e ≡ 1 (mod φ(n)).
3. Convert plaintext message M to an integer and compute ciphertext C = M ^ e mod n.
4. Compute plaintext M = C ^ d mod n using private exponent d.
5. Ensure RSA security by selecting large prime numbers and safeguarding private key d; use RSA for secure communication, digital signatures, and encryption.

PROGRAM:

```
import java.math.*;
import java.util.*;
public class Main {
  public static int getGCD(int mod, int num) {
    // If the mod is zero, return the num
    if (mod == 0)
      return num;
    else
      // recursive function call
      return getGCD(num % mod, mod);
  }
  public static void main(String args[]) {
    int d = 0, e; // Intialization
    int message = 32; // number message
    int prime1 = 5; // 1st prime number p
    int prime2 = 7; // 2nd prime number q
    int primeMul = prime1 * prime2; // performing operations
    int primeMul1 = (prime1 - 1) * (prime2 - 1);
    System.out.println("primeMul1 is equal to : " + primeMul1 + "\n");
    for (e = 2; e < primeMul1; e++) {
      // Here e is a public key
      if (getGCD(e, primeMul1) == 1) {
        break;
      }
    }
    System.out.println("Public key e is = " + e);
    // Calculating the private key
    for (int m = 0; m <= 9; m++) {
      // get the value of temp
      int temp = 1 + (m * primeMul1);
      // private key
      if (temp % e == 0) {
        d = temp / e;
        break;
      }
    }
    System.out.println("d is : " + d);
    double cipher;
    BigInteger d_message;
    cipher = (Math.pow(message, e)) % primeMul;
    System.out.println("Cipher text is : " + cipher);

    BigInteger bigN = BigInteger.valueOf(primeMul);

    BigInteger bigC = BigDecimal.valueOf(cipher).toBigInteger();

    d_message = (bigC.pow(d)).mod(bigN);

    System.out.println("Decrypted text is : " + d_message);
  }
}
```

OUTPUT:



```
primeMul1 is equal to : 24

Public key e is = 5
d is : 5
Cipher text is : 2.0
Decrypted text is : 32


...Program finished with exit code 0
Press ENTER to exit console.
```

RESULT: