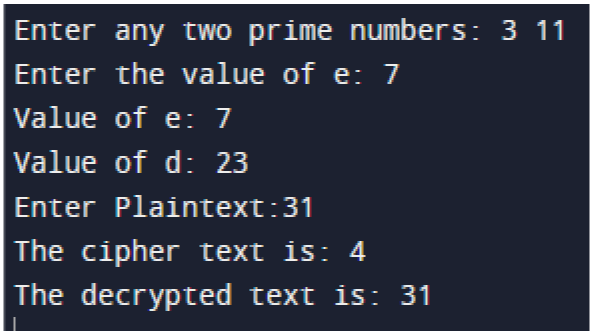
Experiment No. 2

Aim: Implementation and analysis of RSA cryptosystem

Program:

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
int checkPrime(int n)
{
    int i;
    int m = n / 2;
    for (i = 2; i <= m; i++)
    {
        if (n % i == 0)
        {
            return 0; // Not Prime
        }
    }
    return 1;
}
int findGCD(int n1, int n2)
{
    int i, gcd;
    for (i = 1; i <= n1 && i <= n2; ++i)
    {
        if (n1 % i == 0 && n2 % i == 0)
            gcd = i;
    }
    return gcd;
}
int powMod(int a, int b, int n)
{
    long long x = 1, y = a;
    while (b > 0)
    {
        if (b % 2 == 1)
            x = (x * y) % n;
        y = (y * y) % n;
        b /= 2;
    }
    return x % n;
}
int main(int argc, char *argv[])
{
    int p, q, n, phin, data, cipher, decrypt;
    while (1)
    {
        printf("Enter any two prime numbers: ");
        scanf("%d %d", &p, &q);
        if (!(checkPrime(p) && checkPrime(q)))
            printf("Both numbers are not prime. Please enter prime numbers only...\n");
        else if (!checkPrime(p))
            printf("The first prime number you entered is not prime, please try again...\n");
        else if (!checkPrime(q))
            printf("The second prime number you entered is not prime, try again...\n");
        else
            break;
    }
    n = p * q;
    phin = (p - 1) * (q - 1);
    int e;
    printf("Enter the value of e: ");
    scanf("%d", &e);
    for (e = 5; e <= 100; e++)
    {
        if (findGCD(phin, e) == 1)
            break;
    }
    int d = 0;
    for (d = e + 1; d <= 100; d++)
    {
        if (((d * e) % phin) == 1)
            break;
    }
    printf("Value of e: %d\nValue of d: %d\n", e, d);
    printf("Enter Plaintext:");
    scanf("%d", &data);
    cipher = powMod(data, e, n);
    printf("The cipher text is: %d\n", cipher);
    decrypt = powMod(cipher, d, n);
    printf("The decrypted text is: %d\n", decrypt);
    return 0;
}
```

Output:



```
Enter any two prime numbers: 3 11
Enter the value of e: 7
Value of e: 7
Value of d: 23
Enter Plaintext:31
The cipher text is: 4
The decrypted text is: 31
```