

Exp: 2A
Date: 02-03-2024

RSA Algorithm

Aim:

To write a python program implementing the RSA algorithm.

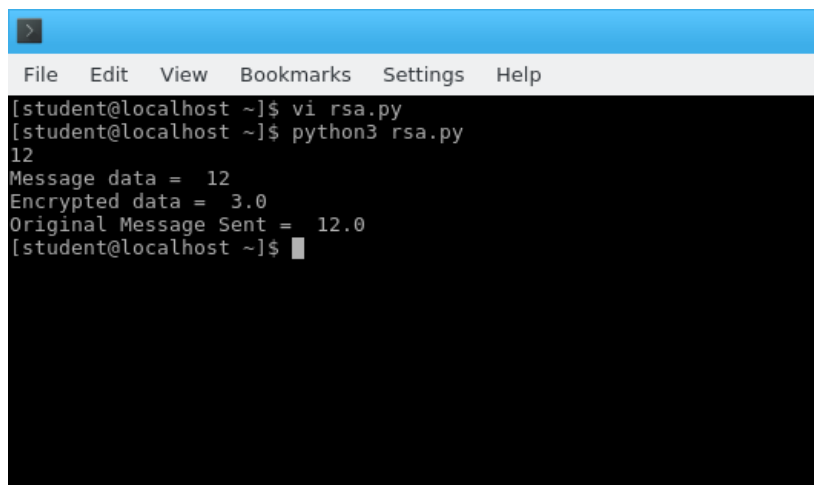
Algorithm:

1. Choose two large prime numbers (p and q)
2. Calculate $n = p \cdot q$ and $z = (p-1)(q-1)$
3. Choose a number e where $1 < e < z$.
4. Calculate $d = e^{-1} \bmod (p-1)(q-1)$
5. You can bundle private key pair as (n,d)
6. You can bundle public key pair as (n,e)
7. Encrypt using public key and decrypt using private key.

Program:

```
import math
def gcd(a, h):
    temp = 0
    while(1):
        temp = a % h
        if (temp == 0):
            return h
        a = h
        h = temp
p = 3
q = 7
n = p*q
e = 2
phi = (p-1)*(q-1)
while (e < phi):
    if(gcd(e, phi) == 1):
        break
    else:
        e = e+1
k = 2
```

```
d = (1 + (k*phi))/e
msg = int(input())
print("Message data = ", msg)
c = pow(msg, e)
c = math.fmod(c, n)
print("Encrypted data = ", c)
m = pow(c, d)
m = math.fmod(m, n)
print("Original Message Sent = ", m)
```

Output:A screenshot of a terminal window with a blue title bar and a menu bar containing 'File', 'Edit', 'View', 'Bookmarks', 'Settings', and 'Help'. The terminal shows a user at a prompt editing a file named 'rsa.py' with 'vi'. Then, the user runs 'python3 rsa.py' and enters '12' as input. The program outputs 'Message data = 12', 'Encrypted data = 3.0', and 'Original Message Sent = 12.0' before returning to the prompt.

```
[student@localhost ~]$ vi rsa.py
[student@localhost ~]$ python3 rsa.py
12
Message data = 12
Encrypted data = 3.0
Original Message Sent = 12.0
[student@localhost ~]$
```

Result:

Thus the python program for RSA algorithm is implemented successfully.