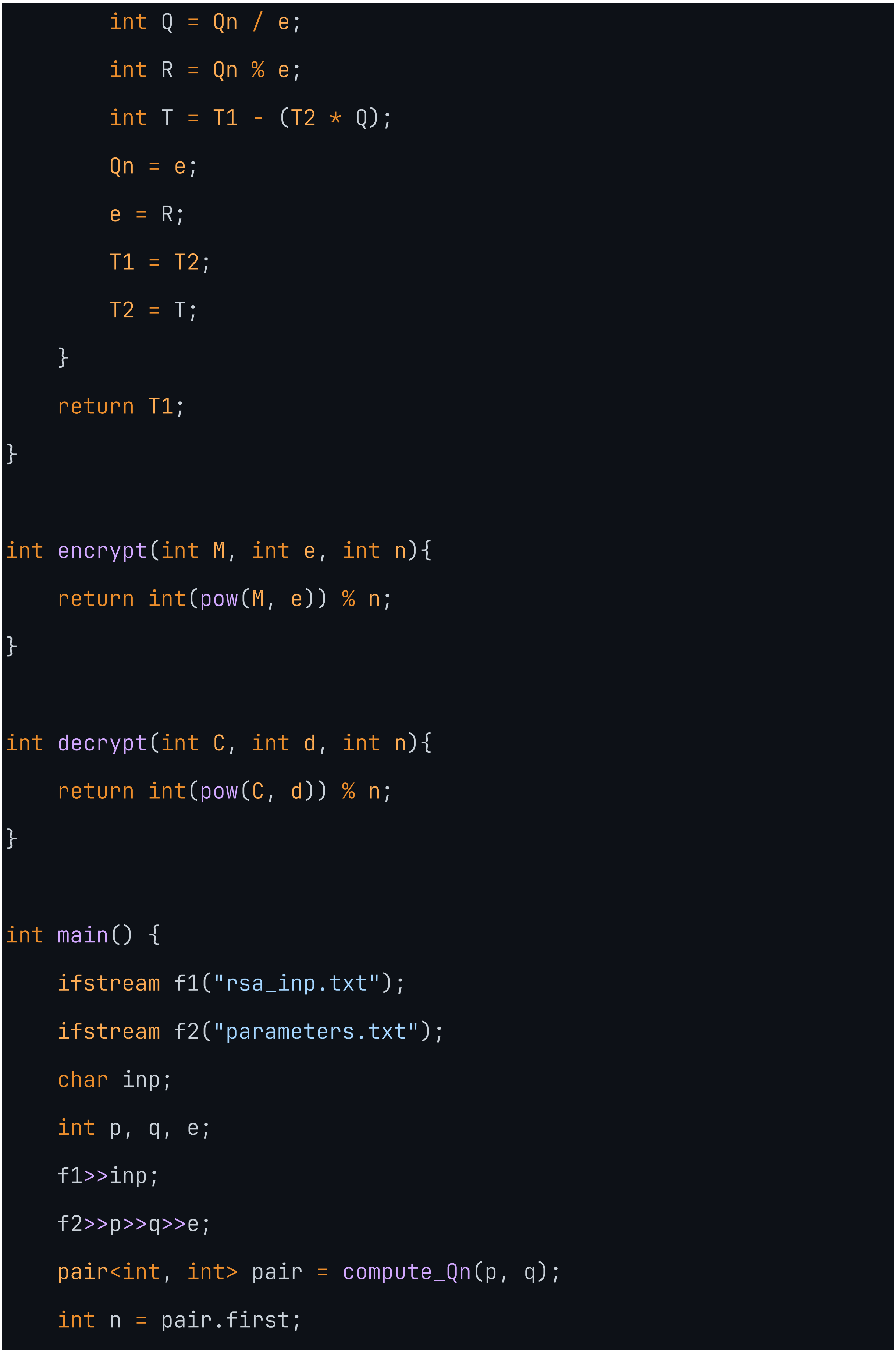
Information and Network Security
2CSDE54
Practical 6

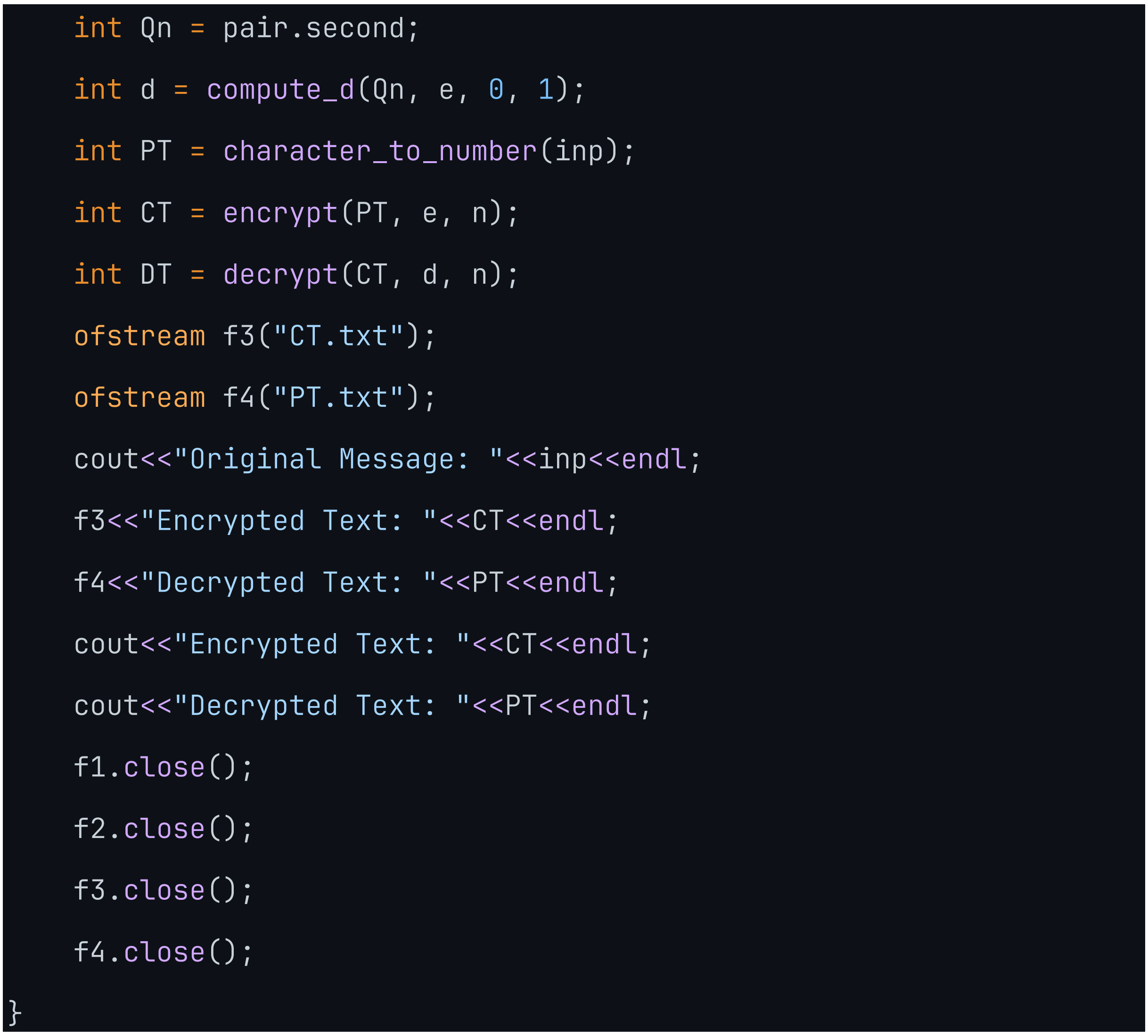
21BCE020

Implementation of RSA Algorithm

```
#include <iostream>
#include <algorithm>
#include <string>
#include <fstream>
#include <cctype>
#include <math.h>
using namespace std;

int character_to_number(const char& ch){
    char c = toupper(ch);
    if (c >= 'A' && c <= 'Z') return c - 'A';
}

pair<int, int> compute_Qn(int p, int q){
    int n = p * q;
    int Qn = (p - 1) * (q - 1);
    pair<int, int> pair = make_pair(n, Qn);
    return pair;
}

int compute_d(int Qn, int e, int T1, int T2){
    while(e > 0){
```

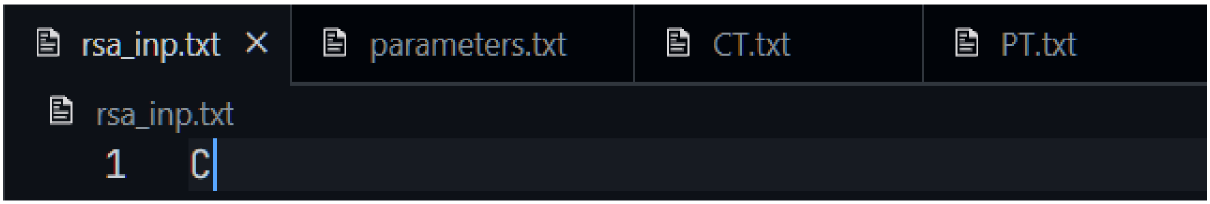


```
        int Q = Qn / e;
        int R = Qn % e;
        int T = T1 - (T2 * Q);
        Qn = e;
        e = R;
        T1 = T2;
        T2 = T;
    }
    return T1;
}

int encrypt(int M, int e, int n){
    return int(pow(M, e)) % n;
}

int decrypt(int C, int d, int n){
    return int(pow(C, d)) % n;
}

int main() {
    ifstream f1("rsa_inp.txt");
    ifstream f2("parameters.txt");
    char inp;
    int p, q, e;
    f1>>inp;
    f2>>p>>q>>e;
    pair<int, int> pair = compute_Qn(p, q);
    int n = pair.first;
```

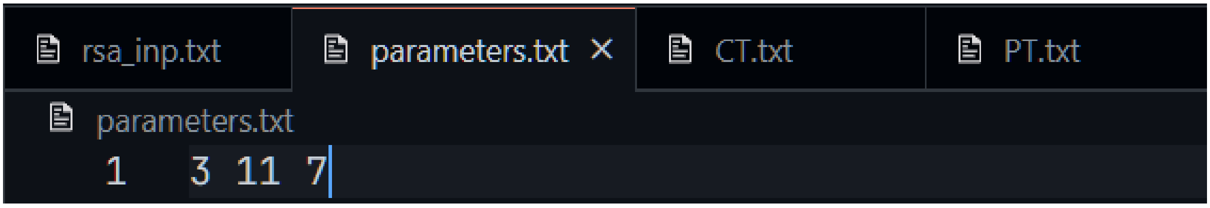


```
    int Qn = pair.second;
    int d = compute_d(Qn, e, 0, 1);
    int PT = character_to_number(inp);
    int CT = encrypt(PT, e, n);
    int DT = decrypt(CT, d, n);
    ofstream f3("CT.txt");
    ofstream f4("PT.txt");
    cout<<"Original Message: "<<inp<<endl;
    f3<<"Encrypted Text: "<<CT<<endl;
    f4<<"Decrypted Text: "<<PT<<endl;
    cout<<"Encrypted Text: "<<CT<<endl;
    cout<<"Decrypted Text: "<<PT<<endl;
    f1.close();
    f2.close();
    f3.close();
    f4.close();
}
```

Text File Input:

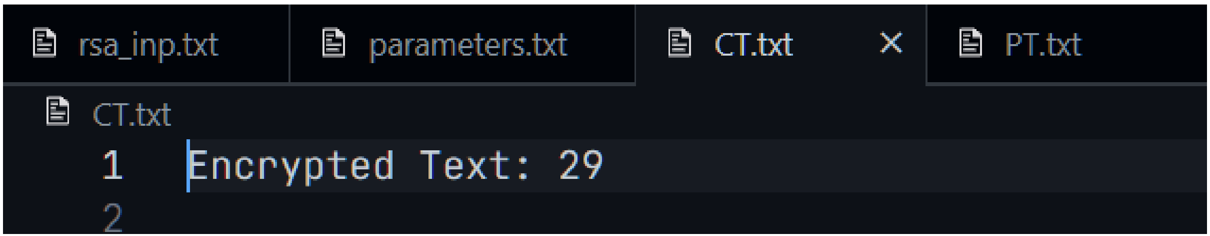


```
C
```

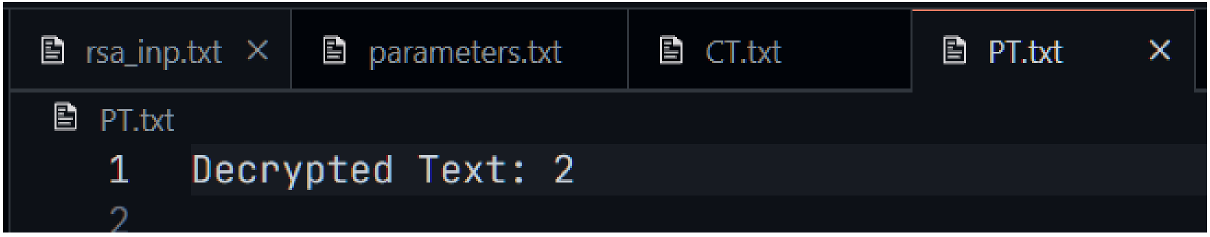


```
3 11 7
```

<u>Text File Output</u>:



```
Encrypted Text: 29
```



```
Decrypted Text: 2
```