AIM: Perform encryption and decryption using the following block cipher techniques (Feistel Cipher)

Feistel Cipher model is a structure or a design used to develop many block ciphers such as DES. Feistel cipher may have invertible, non-invertible and self invertible components in its design. Same encryption as well as decryption algorithm is used. A separate key is used for each round. However same round keys are used for encryption as well as decryption.

Feistel cipher algorithm

1. Read list of all the Plain Text characters from the file (consider 2 character: block size)
2. Convert the Plain Text to Ascii and then 8-bit binary format.
3. Divide the binary Plain Text string into two halves: left half (L1) and right half (R1)
4. Generate a random binary keys (K1 and K2) of length equal to the half the length of the Plain Text for the two rounds.

First Round of Encryption

a. Generate function f1 using R1 and K1 as follows:

f1= xor(R1, K1) consider key k1: 'A'

b. Now the new left half(L2) and right half(R2) after round 1 are as follows:

R2= xor(f1, L1)

L2=R1

Second Round of Encryption

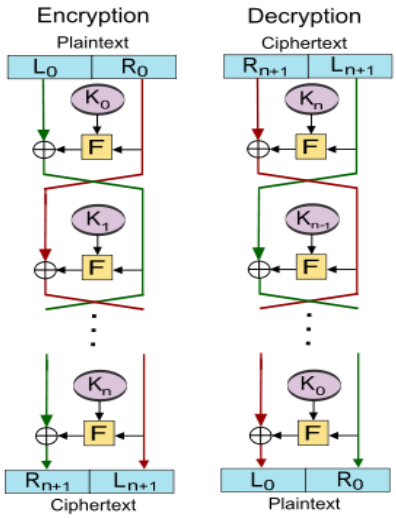
a. Generate function f2 using R2 and K2 as follows:

f2= xor(R2, K2) consider key k1: 'B'

b. Now the new left half(L3) and right half(R3) after round 2 are as follows:

R3= xor(f2, L2)

L3=R2



Concatenation of R3 to L3 is the Cipher Text

Same algorithm is used for decryption to retrieve the Plain Text from the Cipher Text.

Note: Read the input from the file create a block of 16 bit i.e two characters at a time.

METHODOLOGY FOLLOWED:

```
#include <iostream>
#include<bits/stdc++.h>
#include<fstream>

using namespace std;
```

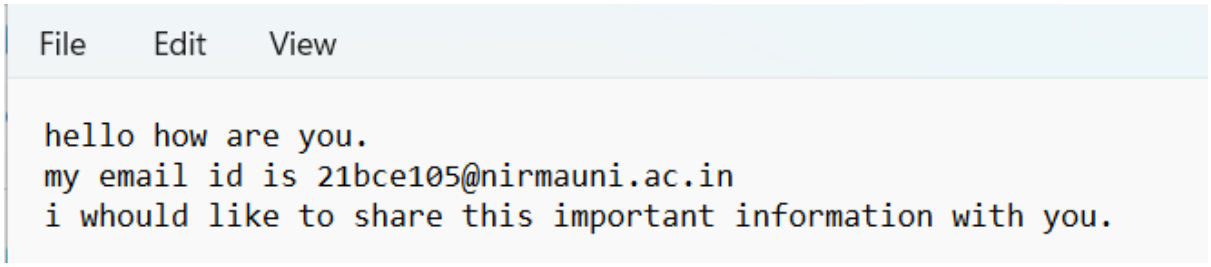
```
string encryption(char L1,char R1,char K1,char K2){

    // first round

    char F1 = R1^K1;
    char R2 = F1^L1;
    char L2 = R1;

    //second round

    char F2 = R2^K2;
    char R3 =F2^L2;
    char L3 = R2;

    string st;
    st.push_back(R3);
    st.push_back(L3);
    return st;
}


string decryption(char L1,char R1,char K1,char K2){

    // first round

    char F1 = R1^K2;
    char R2 = F1^L1;
    char L2 = R1;

    //second round

    char F2 =R2^K1;
    char R3 =F2^L2;
    char L3 = R2;

    string st;
    st.push_back(R3);
    st.push_back(L3);
    return st;

}

int main()
{
    string st;
    char L1=' ';
    char R1=' ';
    char K1 = rand()%26+'A';
    char K2 = rand()%26+'A';
```

```
    cout<<"KEY1 : "<<K1<<"\n";
    cout<<"KEY2 : "<<K2<<"\n";

     ifstream fin;
     fin.open("input.txt");
     ofstream fout;
     fout.open("output.txt");

 // encryption
 while(fin.get(L1) && fin.get(R1)){

        fout<<encryption(L1,R1,K1,K2);
  }

 R1=' ';
 fout<<encryption(L1,R1,K1,K2);


   fin.close();
   fout.close();


     ifstream fin2;
    fin2.open("output.txt");
    ofstream fout2;
    fout2.open("doutput.txt");

  //decryption

  while(fin2.get(L1) && fin2.get(R1)){
    fout2<<decryption(L1,R1,K1,K2);
  }

 fin.close();
 fout2.close();

    return 0;
}
```

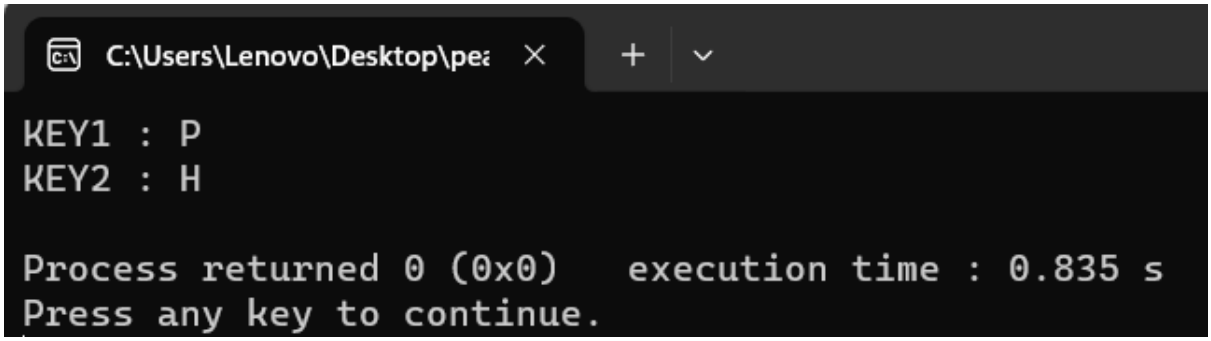
- **INPUT:**

  - Here program gets Input from input.txt file

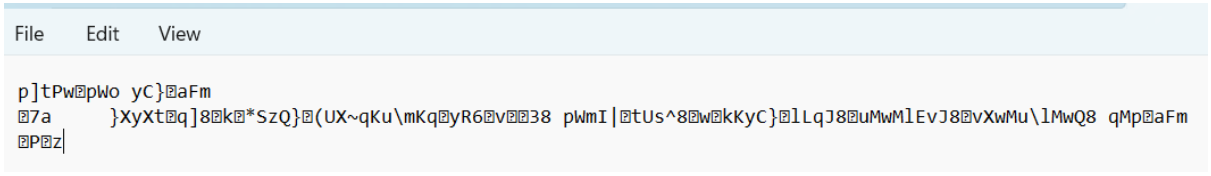
    Key1 and key2 – randomly generate.



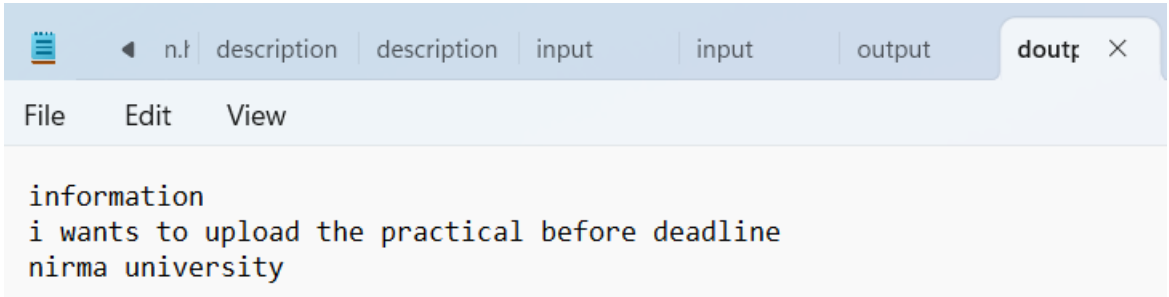
- Generated keys:



- After execution of the program, Encrypted message write in output.txt file



- For decryption,
  Input from (encrypted message) - output.txt file
  Output (decrypted message) - doutput.txt file



Note: this program done both the task -> (1) encryption and (2) decryption.