**AIM**: Implement DES algorithm.

**Code**:

def hex2bin(s):

mp = {'0': "0000",

'1': "0001",

'2': "0010",

'3': "0011",

'4': "0100",

'5': "0101",

'6': "0110",

'7': "0111",

'8': "1000",

'9': "1001",

'A': "1010",

'B': "1011",

'C': "1100",

'D': "1101",

'E': "1110",

'F': "1111"}

bin = ""

for i in range(len(s)):

bin = bin + mp[s[i]]

return bin

def bin2hex(s):

mp = {"0000": '0',

"0001": '1',

"0010": '2',

"0011": '3',

"0100": '4',

"0101": '5',

"0110": '6',

"0111": '7',

"1000": '8',

"1001": '9',

"1010": 'A',

"1011": 'B',

"1100": 'C',

"1101": 'D',

"1110": 'E',

"1111": 'F'}

hex = ""

for i in range(0, len(s), 4):

ch = ""

ch = ch + s[i]

ch = ch + s[i + 1]

ch = ch + s[i + 2]

ch = ch + s[i + 3]

hex = hex + mp[ch]

return hex

def bin2dec(binary):

decimal, i = 0, 0

while(binary != 0):

dec = binary % 10

decimal = decimal + dec \* pow(2, i)

binary = binary//10

i += 1

return decimal

def dec2bin(num):

res = bin(num).replace("0b", "")

if(len(res) % 4 != 0):

div = len(res) / 4

div = int(div)

counter = (4 \* (div + 1)) - len(res)

for i in range(0, counter):

res = '0' + res

return res

def permute(k, arr, n):

permutation = ""

for i in range(0, n):

permutation = permutation + k[arr[i] - 1]

return permutation

def shift\_left(k, nth\_shifts):

s = ""

for i in range(nth\_shifts):

for j in range(1, len(k)):

s = s + k[j]

s = s + k[0]

k = s

s = ""

return k

def xor(a, b):

ans = ""

for i in range(len(a)):

if a[i] == b[i]:

ans = ans + "0"

else:

ans = ans + "1"

return ans

initial\_perm = [58, 50, 42, 34, 26, 18, 10, 2,60, 52, 44, 36, 28, 20, 12, 4,62, 54, 46, 38, 30, 22, 14, 6,64, 56, 48, 40, 32, 24, 16, 8,57, 49, 41, 33, 25, 17, 9, 1,59, 51, 43, 35, 27, 19, 11, 3,61, 53, 45, 37, 29, 21, 13, 5,63, 55, 47, 39, 31, 23, 15, 7]

exp\_d = [32, 1, 2, 3, 4, 5, 4, 5,6, 7, 8, 9, 8, 9, 10, 11,12, 13, 12, 13, 14, 15, 16, 17,16, 17, 18, 19, 20, 21, 20, 21,22, 23, 24, 25, 24, 25, 26, 27,28, 29, 28, 29, 30, 31, 32, 1]

per = [16, 7, 20, 21,

29, 12, 28, 17,

1, 15, 23, 26,

5, 18, 31, 10,

2, 8, 24, 14,

32, 27, 3, 9,

19, 13, 30, 6,

22, 11, 4, 25]

sbox = [[[14, 4, 13, 1, 2, 15, 11, 8, 3, 10, 6, 12, 5, 9, 0, 7],

[0, 15, 7, 4, 14, 2, 13, 1, 10, 6, 12, 11, 9, 5, 3, 8],

[4, 1, 14, 8, 13, 6, 2, 11, 15, 12, 9, 7, 3, 10, 5, 0],

[15, 12, 8, 2, 4, 9, 1, 7, 5, 11, 3, 14, 10, 0, 6, 13]],

[[15, 1, 8, 14, 6, 11, 3, 4, 9, 7, 2, 13, 12, 0, 5, 10],

[3, 13, 4, 7, 15, 2, 8, 14, 12, 0, 1, 10, 6, 9, 11, 5],

[0, 14, 7, 11, 10, 4, 13, 1, 5, 8, 12, 6, 9, 3, 2, 15],

[13, 8, 10, 1, 3, 15, 4, 2, 11, 6, 7, 12, 0, 5, 14, 9]],

[[10, 0, 9, 14, 6, 3, 15, 5, 1, 13, 12, 7, 11, 4, 2, 8],

[13, 7, 0, 9, 3, 4, 6, 10, 2, 8, 5, 14, 12, 11, 15, 1],

[13, 6, 4, 9, 8, 15, 3, 0, 11, 1, 2, 12, 5, 10, 14, 7],

[1, 10, 13, 0, 6, 9, 8, 7, 4, 15, 14, 3, 11, 5, 2, 12]],

[[7, 13, 14, 3, 0, 6, 9, 10, 1, 2, 8, 5, 11, 12, 4, 15],

[13, 8, 11, 5, 6, 15, 0, 3, 4, 7, 2, 12, 1, 10, 14, 9],

[10, 6, 9, 0, 12, 11, 7, 13, 15, 1, 3, 14, 5, 2, 8, 4],

[3, 15, 0, 6, 10, 1, 13, 8, 9, 4, 5, 11, 12, 7, 2, 14]],

[[2, 12, 4, 1, 7, 10, 11, 6, 8, 5, 3, 15, 13, 0, 14, 9],

[14, 11, 2, 12, 4, 7, 13, 1, 5, 0, 15, 10, 3, 9, 8, 6],

[4, 2, 1, 11, 10, 13, 7, 8, 15, 9, 12, 5, 6, 3, 0, 14],

[11, 8, 12, 7, 1, 14, 2, 13, 6, 15, 0, 9, 10, 4, 5, 3]],

[[12, 1, 10, 15, 9, 2, 6, 8, 0, 13, 3, 4, 14, 7, 5, 11],

[10, 15, 4, 2, 7, 12, 9, 5, 6, 1, 13, 14, 0, 11, 3, 8],

[9, 14, 15, 5, 2, 8, 12, 3, 7, 0, 4, 10, 1, 13, 11, 6],

[4, 3, 2, 12, 9, 5, 15, 10, 11, 14, 1, 7, 6, 0, 8, 13]],

[[4, 11, 2, 14, 15, 0, 8, 13, 3, 12, 9, 7, 5, 10, 6, 1],

[13, 0, 11, 7, 4, 9, 1, 10, 14, 3, 5, 12, 2, 15, 8, 6],

[1, 4, 11, 13, 12, 3, 7, 14, 10, 15, 6, 8, 0, 5, 9, 2],

[6, 11, 13, 8, 1, 4, 10, 7, 9, 5, 0, 15, 14, 2, 3, 12]],

[[13, 2, 8, 4, 6, 15, 11, 1, 10, 9, 3, 14, 5, 0, 12, 7],

[1, 15, 13, 8, 10, 3, 7, 4, 12, 5, 6, 11, 0, 14, 9, 2],

[7, 11, 4, 1, 9, 12, 14, 2, 0, 6, 10, 13, 15, 3, 5, 8],

[2, 1, 14, 7, 4, 10, 8, 13, 15, 12, 9, 0, 3, 5, 6, 11]]]

final\_perm = [40, 8, 48, 16, 56, 24, 64, 32,39, 7, 47, 15, 55, 23, 63, 31,38, 6, 46, 14, 54, 22, 62, 30,37, 5, 45, 13, 53, 21, 61, 29,36, 4, 44, 12, 52, 20, 60, 28,35, 3, 43, 11, 51, 19, 59, 27,34, 2, 42, 10, 50, 18, 58, 26,33, 1, 41, 9, 49, 17, 57, 25]

def encrypt(pt, rkb, rk):

pt = hex2bin(pt)

pt = permute(pt, initial\_perm, 64)

print("After initial permutation", bin2hex(pt))

left = pt[0:32]

right = pt[32:64]

for i in range(0, 16):

right\_expanded = permute(right, exp\_d, 48)

xor\_x = xor(right\_expanded, rkb[i])

sbox\_str = ""

for j in range(0, 8):

row = bin2dec(int(xor\_x[j \* 6] + xor\_x[j \* 6 + 5]))

col = bin2dec(

int(xor\_x[j \* 6 + 1] + xor\_x[j \* 6 + 2] + xor\_x[j \* 6 + 3] + xor\_x[j \* 6 + 4]))

val = sbox[j][row][col]

sbox\_str = sbox\_str + dec2bin(val)

sbox\_str = permute(sbox\_str, per, 32)

result = xor(left, sbox\_str)

left = result

if(i != 15):

left, right = right, left

print("Round ", i + 1, " ", bin2hex(left),

" ", bin2hex(right), " ", rk[i])

combine = left + right

cipher\_text = permute(combine, final\_perm, 64)

return cipher\_text

pt = "ABCDEF1234567890"

key = "AABB09182736CCDD"

key = hex2bin(key)

keyp = [57, 49, 41, 33, 25, 17, 9,1, 58, 50, 42, 34, 26, 18,10, 2, 59, 51, 43, 35, 27,19, 11, 3, 60, 52, 44, 36,63, 55, 47, 39, 31, 23, 15,7, 62, 54, 46, 38, 30, 22,14, 6, 61, 53, 45, 37, 29,21, 13, 5, 28, 20, 12, 4]

key = permute(key, keyp, 56)

shift\_table = [1, 1, 2, 2,2, 2, 2, 2,1, 2, 2, 2,2, 2, 2, 1]

key\_comp = [14, 17, 11, 24, 1, 5,3, 28, 15, 6, 21, 10,23, 19, 12, 4, 26, 8,16, 7, 27, 20, 13, 2,41, 52, 31, 37, 47, 55,30, 40, 51, 45, 33, 48,44, 49, 39, 56, 34, 53,46, 42, 50, 36, 29, 32]

left = key[0:28]

right = key[28:56]

rkb = []

rk = []

for i in range(0, 16):

left = shift\_left(left, shift\_table[i])

right = shift\_left(right, shift\_table[i])

combine\_str = left + right

round\_key = permute(combine\_str, key\_comp, 48)

rkb.append(round\_key)

rk.append(bin2hex(round\_key))

print("Encryption")

cipher\_text = bin2hex(encrypt(pt, rkb, rk))

print("Cipher Text : ", cipher\_text)

print("Decryption")

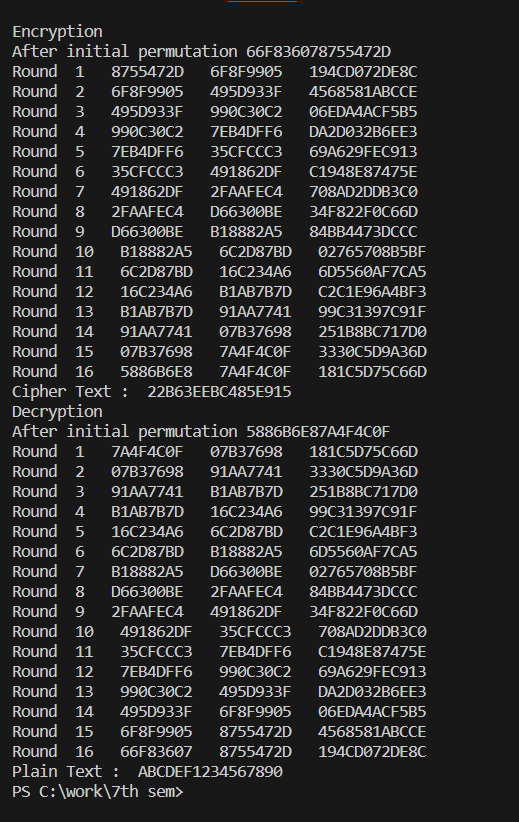
rkb\_rev = rkb[::-1]

rk\_rev = rk[::-1]

text = bin2hex(encrypt(cipher\_text, rkb\_rev, rk\_rev))

print("Plain Text : ", text)

**output:**

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**AIM**: Implement AES algorithm.

**Code:**

from Crypto.Cipher import AES

from Crypto.Random import get\_random\_bytes

from Crypto.Protocol.KDF import PBKDF2

from Crypto.Util.Padding import pad, unpad

def generate\_key(password):

    # Generate a 256-bit (32 bytes) key using PBKDF2 with 100,000 iterations

    salt = get\_random\_bytes(16)

    key = PBKDF2(password, salt, dkLen=32, count=100000)

    return key, salt

def aes\_encrypt(key, plaintext):

    # Generate a random 16-byte IV (Initialization Vector)

    iv = get\_random\_bytes(16)

    cipher = AES.new(key, AES.MODE\_CBC, iv)

    ciphertext = cipher.encrypt(pad(plaintext, AES.block\_size))

    return ciphertext, iv

def aes\_decrypt(key, ciphertext, iv):

    cipher = AES.new(key, AES.MODE\_CBC, iv)

    plaintext = unpad(cipher.decrypt(ciphertext), AES.block\_size)

    return plaintext

if \_\_name\_\_ == "\_\_main\_\_":

    # Ask the user to enter a password

    password = input("Enter The Password: ")

    key, salt = generate\_key(password.encode())

    # Ask the user to enter the plaintext as a string

    plaintext = input("Enter The Text: ").encode()

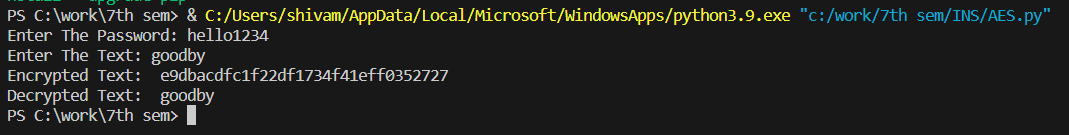
    encrypted\_text, iv = aes\_encrypt(key, plaintext)

    decrypted\_text = aes\_decrypt(key, encrypted\_text, iv)

    print("Encrypted Text: ", encrypted\_text.hex())

    print("Decrypted Text: ", decrypted\_text.decode())

output:



**AIM**: Implement GCD.

Code:

num1 = int(input("enter the num1: "))

num2 = int(input("enter the num2: "))

l1 = []

l2 = []

for i in range(1,num1+1):

if num1 % i == 0:

l1.append(i)

for i in range(1,num2+1):

if num2 % i == 0:

l2.append(i)

print(num1 , "=" , l1)

print(num2 , "=" , l2)

for i in l1:

for j in l2:

if i == j:

max\_num = i

print(max\_num)

Output:

