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CYCLE 2

Computer Networks Lab

1 Write a program for error detecting code using CRC-CCITT (16-bits).

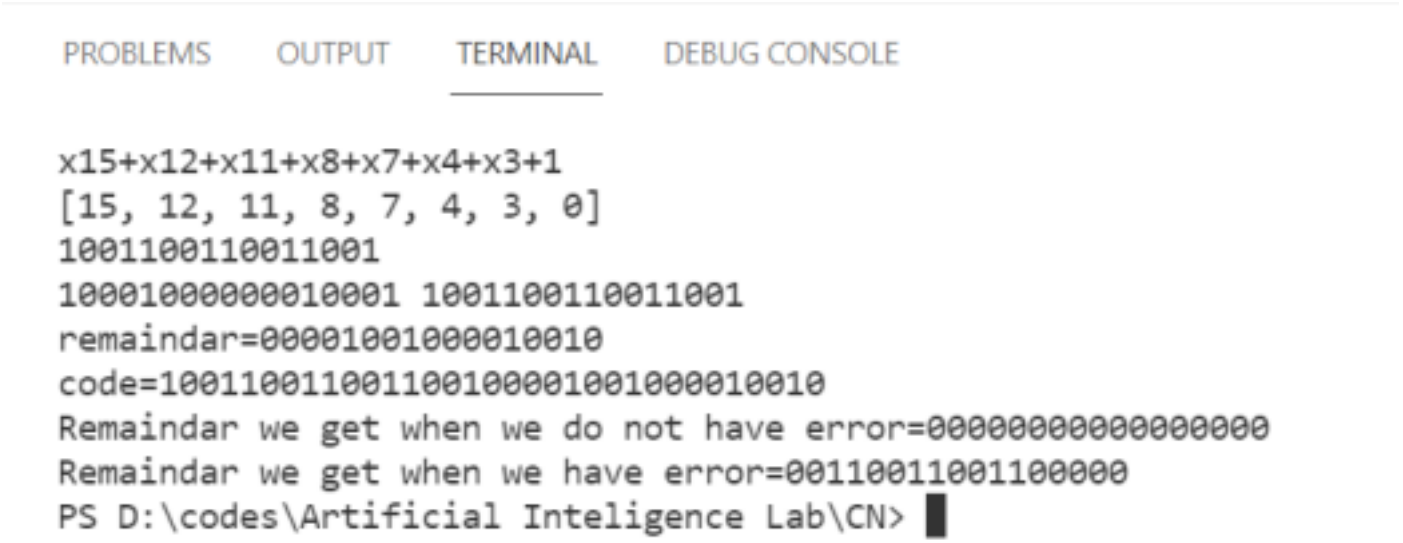
Program :

```
def xor1(a, b):
 x = ""
 # print(len(a),len(b))
 for i in range(1, len(a)):
 if a[i] == b[i]:
 x += "0"
 else:
 x += "1"
 return x

def modulo2(divident, divisor):
 divlen = len(divisor)
 temp = divident[0:divlen]
 # print(temp)
 while(divlen < len(divident)):
 if temp[0] == "1":
 temp = xor1(temp, divisor)+divident[divlen]
 else:
 temp = temp[1:divlen]+divident[divlen]
 # print(temp)
 divlen += 1
 # print(temp)
 if temp[0] == "1":
 temp = xor1(temp, divisor)
 # return "0"+temp
 # print(len(temp),)
 if len(temp) < len(divisor):
 return "0"+temp
 return temp
def encode(data, key):
```

```
append = data+"0"*(len(key))
# print(code)
rem = modulo2(append, key)
print("remaindar="+rem)
code = data+rem
print("code="+code)

# Checking the logic:

rem = modulo2(code, key)
print("Remaindar we get when we do not have error="+rem)
code = code.replace("011", "101")
rem = modulo2(code, key)
print("Remaindar we get when we have error="+rem)


def polytobin(string):
keys = []
key = ""
for i in string:
if i == '+':
keys.append(int(key[1:]))
key = ""
continue
key += i
if key != "":
keys.append(0)
bina = ""
j = 0
print(keys)
for i in range(keys[0], -1, -1):
if i == (keys[j]):
bina += "1"
j += 1
else:
bina += "0"
print(bina)
return bina
string = input("Enter the key polynomial:\n")
key = polytobin(string)
string = input("Enter the data polynomial:\n")
data = polytobin(string)
```

```
print(key, data)
encode(data, key)
```

Output:



2 Write a program for distance vector algorithm to find suitable path for transmission.

Program :

```
class Graph:

 def __init__(self, vertices):
 self.V = vertices
 self.graph = []


 def add_edge(self, s, d, w):
 self.graph.append([s, d, w])


 def print_solution(self, dist, src, next_hop):
 print("Routing table for ", src)
 print("Dest \t Cost \t Next Hop")
 for i in range(self.V):
 print("{0} \t {1} \t {2}".format(i, dist[i], next_hop[i]))
```

```
def bellman_ford(self, src):

dist = [99] * self.V
dist[src] = 0
next_hop = {src: src}
for _ in range(self.V - 1):
for s, d, w in self.graph:
if dist[s] != 99 and dist[s] + w < dist[d]:
dist[d] = dist[s] + w
if s == src:
next_hop[d] =d
elif s in next_hop:
next_hop[d] = next_hop[s]

for s, d, w in self.graph:
if dist[s] != 99 and dist[s] + w < dist[d]:
print("Graph contains negative weight cycle")
return

self.print_solution(dist, src, next_hop)
def main():
matrix = []
print("Enter the no. of routers:")
n = int(input())
print("Enter the adjacency matrix : Enter 99 for infinity")
for i in range(0,n):
a = list(map(int, input().split(" ")))
matrix.append(a)

g = Graph(n)
for i in range(0,n):
for j in range(0,n):
g.add_edge(i,j,matrix[i][j])

for k in range(0, n):
g.bellman_ford(k)

main()
```

Output:

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS D:\codes\Artificial Inteligence Lab\CN> python -u "d:\codes\Artificial Inteli
gence Lab\CN\DistanceVector.py"
Enter the no. of routers:
5
Enter the adjacency matrix : Enter 99 for infinity
0 1 5 99 99
1 0 3 99 9
5 3 0 4 99
99 99 4 0 2
99 9 99 2 0
Routing table for  0
Dest     Cost    Next Hop
0        0       0
1        1       1
2        4       1
3        8       1
4        10      1
Routing table for  1
Dest     Cost    Next Hop
0        1       0
1        0       1
2        3       2
3        7       2
4        9       4
Routing table for  2
Dest     Cost    Next Hop
0        4       1
1        3       1
2        0       2
3        4       3
4        6       3
Routing table for  3
Dest     Cost    Next Hop
0        8       2
1        7       2
2        4       2
3        0       3
4        2       4
Routing table for  4
Dest     Cost    Next Hop
0        10      1
1        9       1
2        6       3
3        2       3
4        0       4
PS D:\codes\Artificial Inteligence Lab\CN>
```

3 Implement Dijkstra's algorithm to compute the shortest path for a given

topology.

Program:

```
#include<bits/stdc++.h>
using namespace std;

#define V 5

int minDistance(int dist[], bool sptSet[])
{

 int min = 9999, min_index;

 for (int v = 0; v < V; v++)
 if (sptSet[v] == false && dist[v] <= min)
 min = dist[v], min_index = v;

 return min_index;
}

void printPath(int parent[], int j)
{
 if (parent[j] == - 1)
 return;

 printPath(parent, parent[j]);

 cout<<j<<" ";
}

void printSolution(int dist[], int n, int parent[])
{
 int src = 0;
 cout<<"Vertex\t Distance\tPath"<<endl;
 for (int i = 1; i < V; i++)
 {
 cout<<"\n"<<src<<" -> "<<i<<" \t "<<dist[i]<<"\t\t"<<src<<" ";
printPath(parent, i);
 }
}
```

```
void dijkstra(int graph[V][V], int src)
{

 int dist[V];

 bool sptSet[V];

 int parent[V];

 for (int i = 0; i < V; i++)
 {
 parent[0] = -1;
 dist[i] = 9999;
 sptSet[i] = false;
 }

 dist[src] = 0;

 for (int count = 0; count < V - 1; count++)
{
 int u = minDistance(dist, sptSet);

 sptSet[u] = true;

 for (int v = 0; v < V; v++)

 if (!sptSet[v] && graph[u][v] &&
 dist[u] + graph[u][v] < dist[v])
 {
 parent[v] = u;
 dist[v] = dist[u] + graph[u][v];
 }
 }

 printSolution(dist, V, parent);
}

int main()
{
 int graph[V][V];
 cout<<"Enter the graph (Enter 99 for infinity): "<<endl;
for(int i = 0; i<V; i++)
```

```
{
for(int j = 0; j<V; j++)
cin>>graph[i][j];
}
cout<<"Enter the source: "<<endl;
int src;
cin>>src;

dijkstra(graph, src);
cout<<endl;
return 0;
}
```

Output:

4 Write a program for congestion control using Leaky bucket algorithm.
Program :

```
#include<bits/stdc++.h>
#include<unistd.h>
using namespace std;
#define bucketSize 500

void bucketInput(int a,int b)
{
        if(a > bucketSize)
                cout<<"\n\t\tBucket overflow";
        else{
```

```
            sleep(5);
            while(a > b){
                cout<<"\n\t\t"<<b<<" bytes outputted.";
                a-=b;
                sleep(5);
            }
            if(a > 0)
                cout<<"\n\t\tLast "<<a<<" bytes sent\t";
            cout<<"\n\t\tBucket output successful";
        }
}
int main()
{
        int op,pktSize;
        cout<<"Enter output rate : ";
        cin>>op;
        for(int i=1;i<=5;i++)
        {
            sleep(rand()%10);
            pktSize=rand()%700;
            cout<<"\nPacket no "<<i<<"\tPacket size = "<<pktSize;
            bucketInput(pktSize,op);
        }
        cout<<endl;
        return 0;
}
```

Output:

```
PS D:\codes\Artificial Inteligence Lab\CN> cd "d:\codes\Artificial Inteligence Lab\CN\" ;
 .\leeky }
Enter output rate : 100

Packet no 1     Packet size = 267
                100 bytes outputted.
                100 bytes outputted.
                Last 67 bytes sent
                Bucket output successful
Packet no 2     Packet size = 600
                Bucket overflow
Packet no 3     Packet size = 324
                100 bytes outputted.
                100 bytes outputted.
                100 bytes outputted.
                Last 24 bytes sent
                Bucket output successful
Packet no 4     Packet size = 658
                Bucket overflow
Packet no 5     Packet size = 664
                Bucket overflow
PS D:\codes\Artificial Inteligence Lab\CN>
```

5 Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

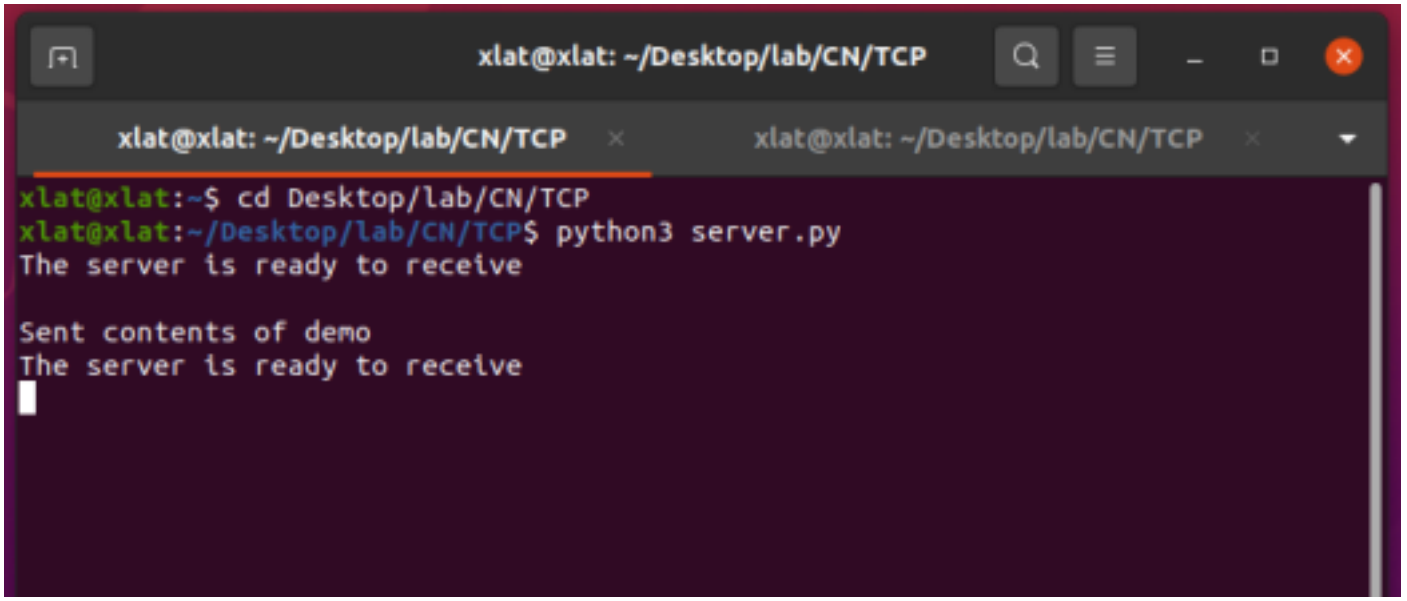
Program:

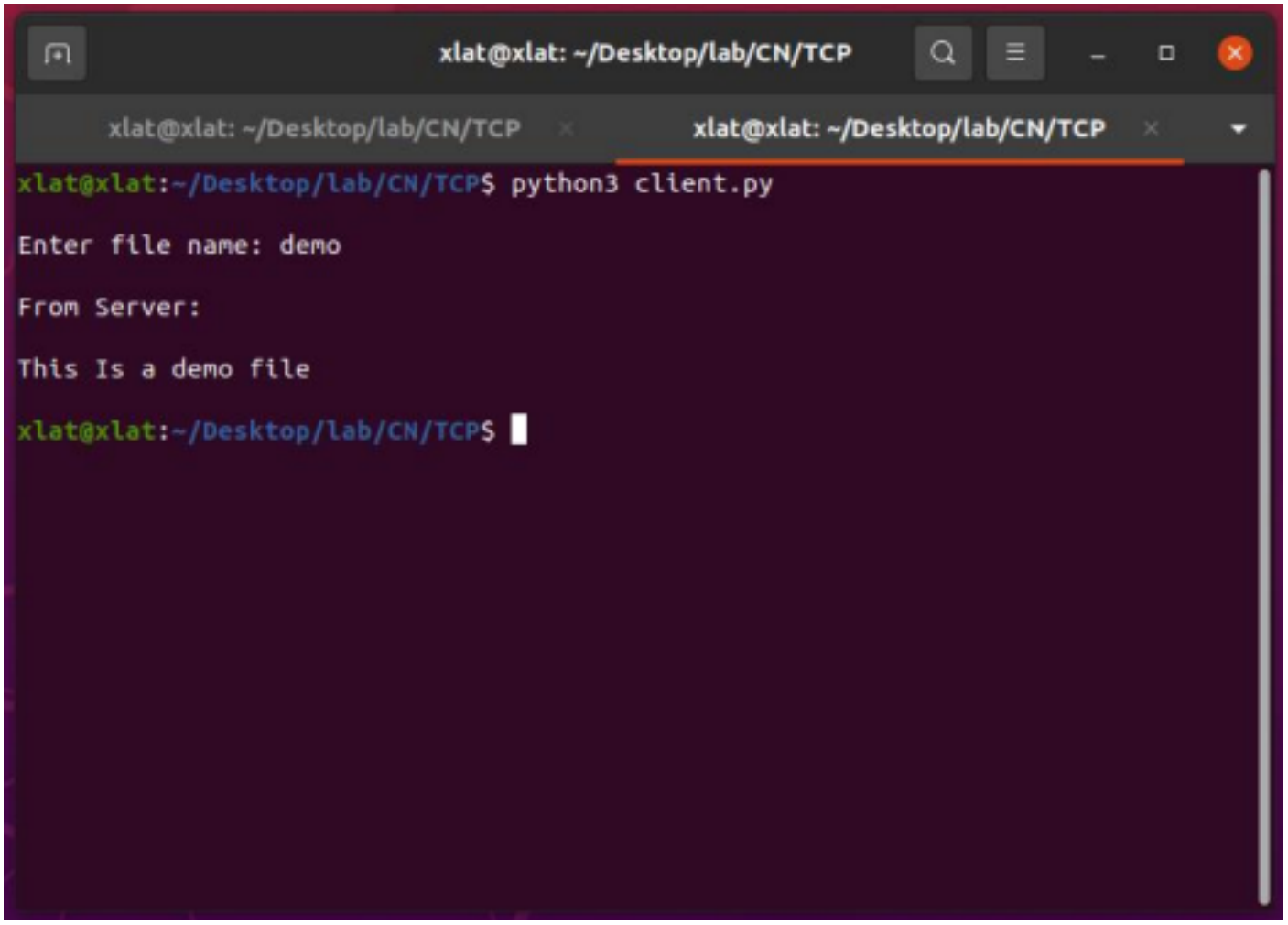
#Client.py
from socket import *
serverName = “127.0.0.1”
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName,serverPort))
sentence = input("Enter file name")
clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print ('From Server:', filecontents)
clientSocket.close()

#Server.py
from socket import *
serverName=”127.0.0.1”
serverPort = 12000
serverSocket = socket(AF_INET,SOCK_STREAM)

```
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
print ("The server is ready to receive")
while 1:
        connectionSocket, addr = serverSocket.accept()
        sentence = connectionSocket.recv(1024).decode()
        file=open(sentence,"r")
        l=file.read(1024)
        connectionSocket.send(l.encode())
        file.close()
        connectionSocket.close()
```

Output:





6 Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

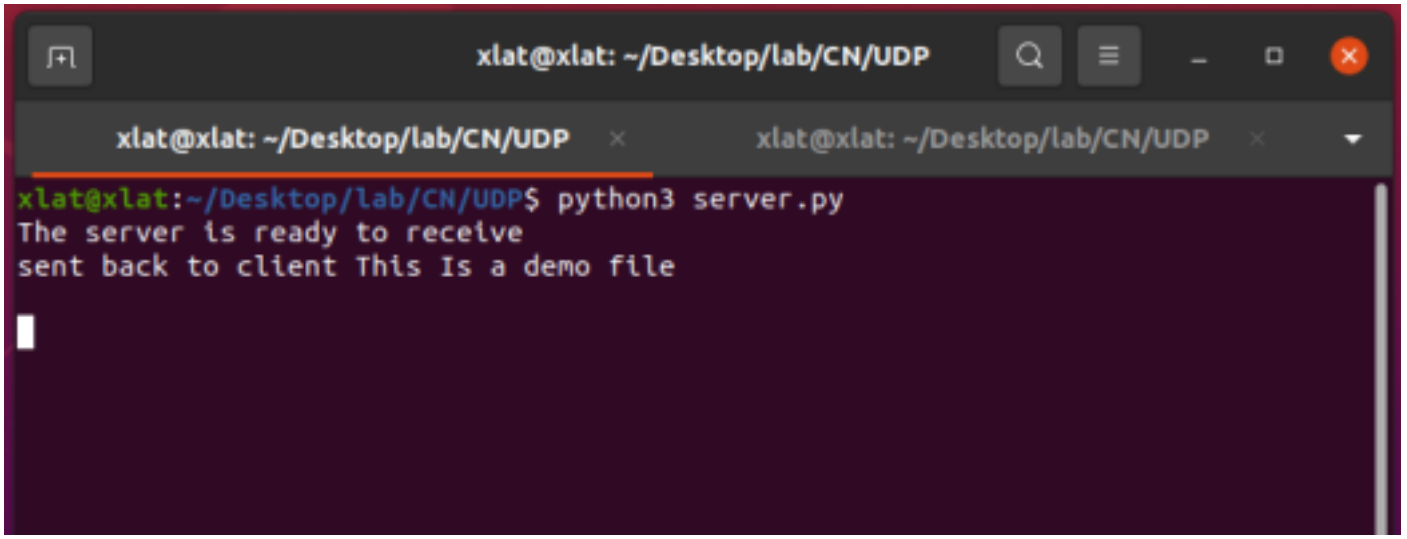
Program:

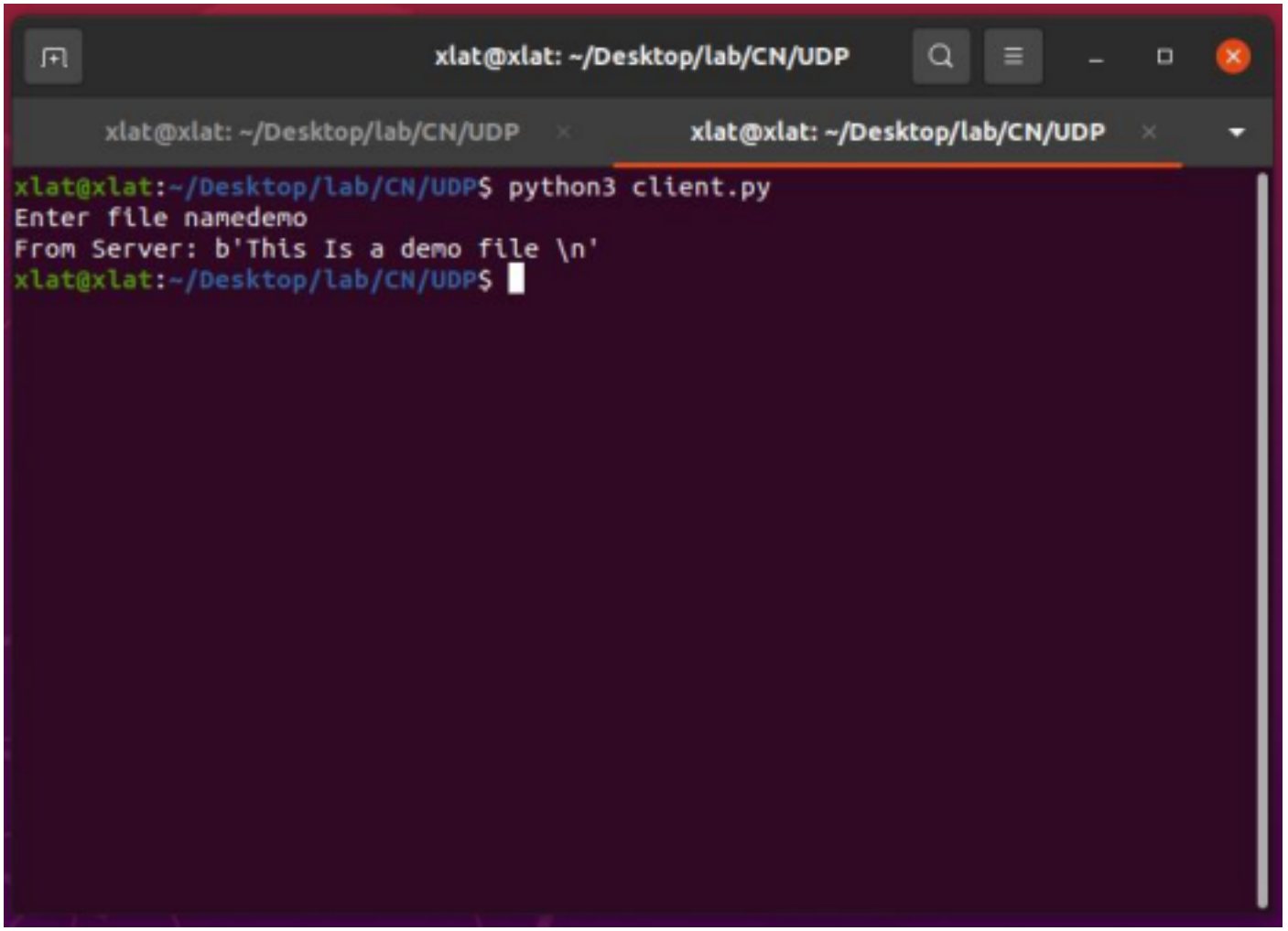
```
#ClientUDP.py
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
sentence = input("Enter file name")
clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))
filecontents,serverAddress = clientSocket.recvfrom(2048)
print ('From Server:', filecontents)
clientSocket.close()


#ServerUDP.py
from socket import *
```

```
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
        sentence,clientAddress = serverSocket.recvfrom(2048)
        file=open(sentence,"r")
        l=file.read(2048)
        serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
        print("sent back to client",l)
        file.close()
```

Output:




xlat@xlat: ~/Desktop/lab/CN/UDP
xlat@xlat: ~/Desktop/lab/CN/UDP
xlat@xlat: ~/Desktop/lab/CN/UDP
xlat@xlat:~/Desktop/lab/CN/UDP$ python3 client.py
Enter file namedemo
From Server: b'This Is a demo file \n'
xlat@xlat:~/Desktop/lab/CN/UDP$