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1BM19CS131

CYCLE 2

Computer Networks Lab

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

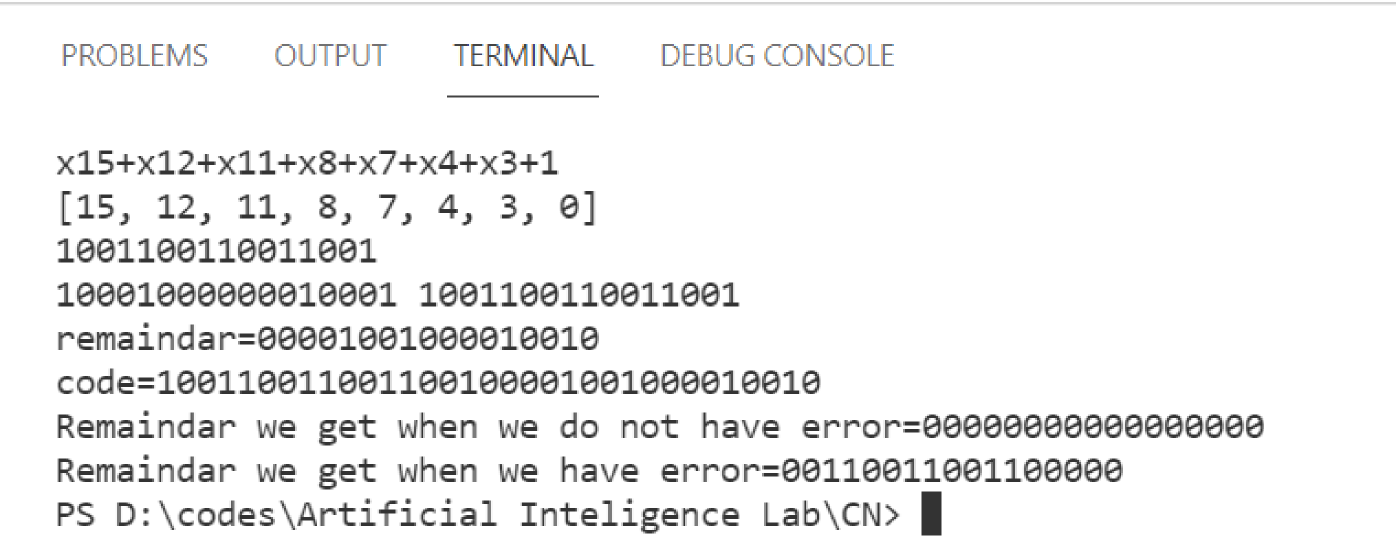
Program :

```
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:



```
x15+x12+x11+x8+x7+x4+x3+1
[15, 12, 11, 8, 7, 4, 3, 0]
1001100110011001
10001000000010001 1001100110011001
remaindar=00001001000010010
code=100110011001100100001001000010010
Remaindar we get when we do not have error=00000000000000000
Remaindar we get when we have error=00110011001100000
PS D:\codes\Artificial Inteligence Lab\CN> 
```

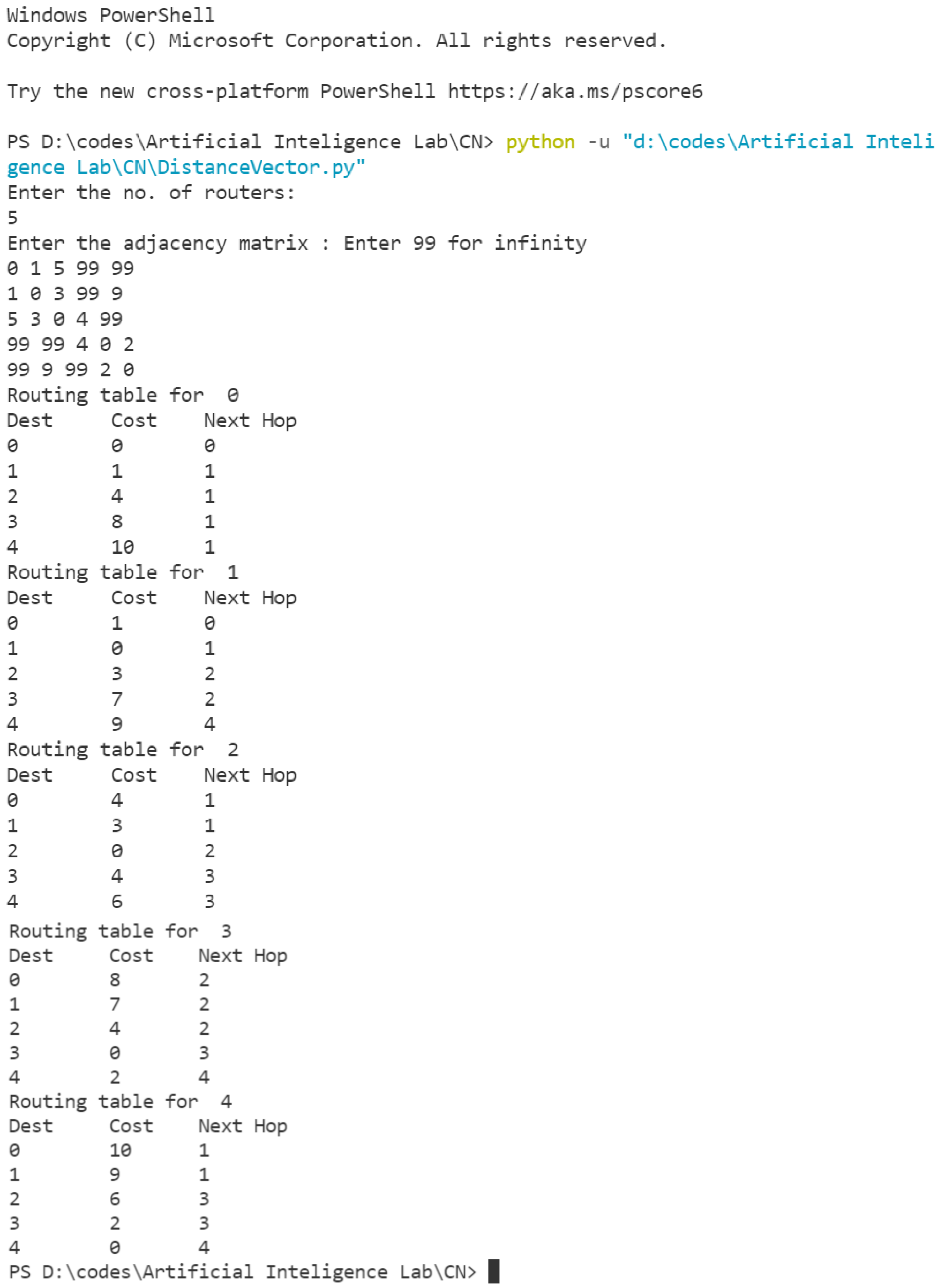
2 Write a program for distance vector algorithm to find suitable path for transmission.

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> █
```
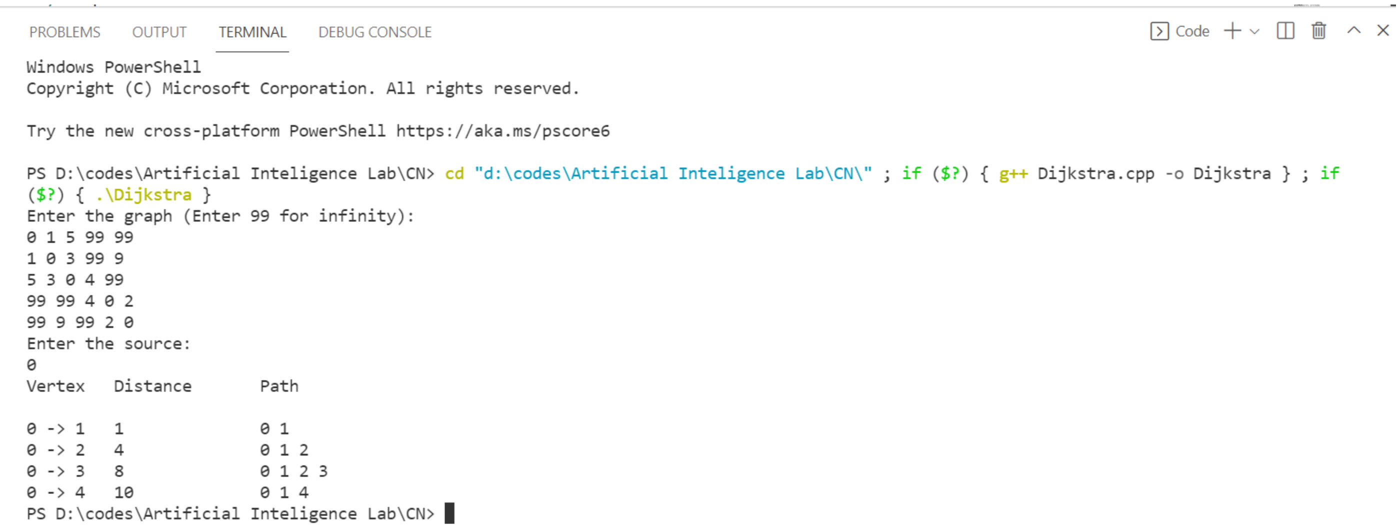

3 Implement Dijkstra's algorithm to compute the shortest path for a given topology.

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:



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

PS D:\codes\Artificial Inteligence Lab\CN> cd "d:\codes\Artificial Inteligence Lab\CN\" ; if ($?) { g++ Dijkstra.cpp -o Dijkstra } ; if
($?) { .\Dijkstra }
Enter the graph (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
Enter the source:
0
Vertex   Distance       Path

0 -> 1   1              0 1
0 -> 2   4              0 1 2
0 -> 3   8              0 1 2 3
0 -> 4   10             0 1 4
PS D:\codes\Artificial Inteligence Lab\CN>
```

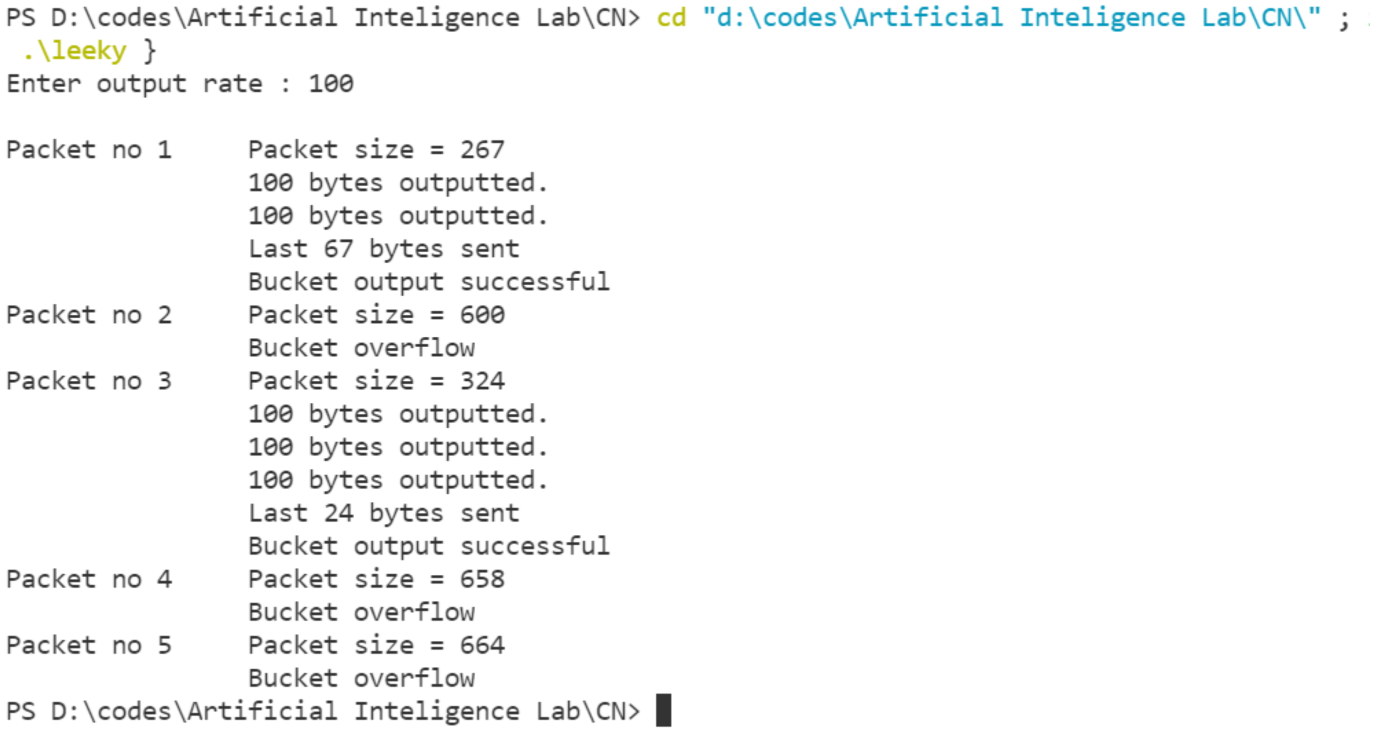
4 Write a program for congestion control using Leaky bucket algorithm.

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> █
```

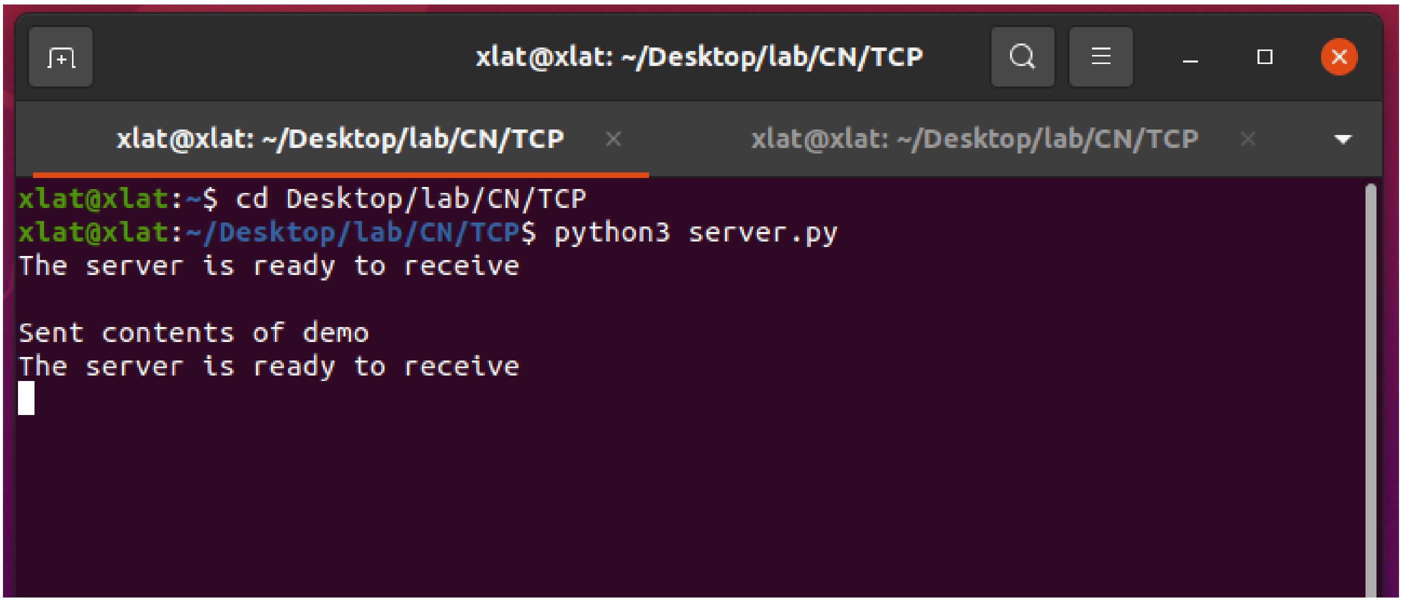
5 Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

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()
```

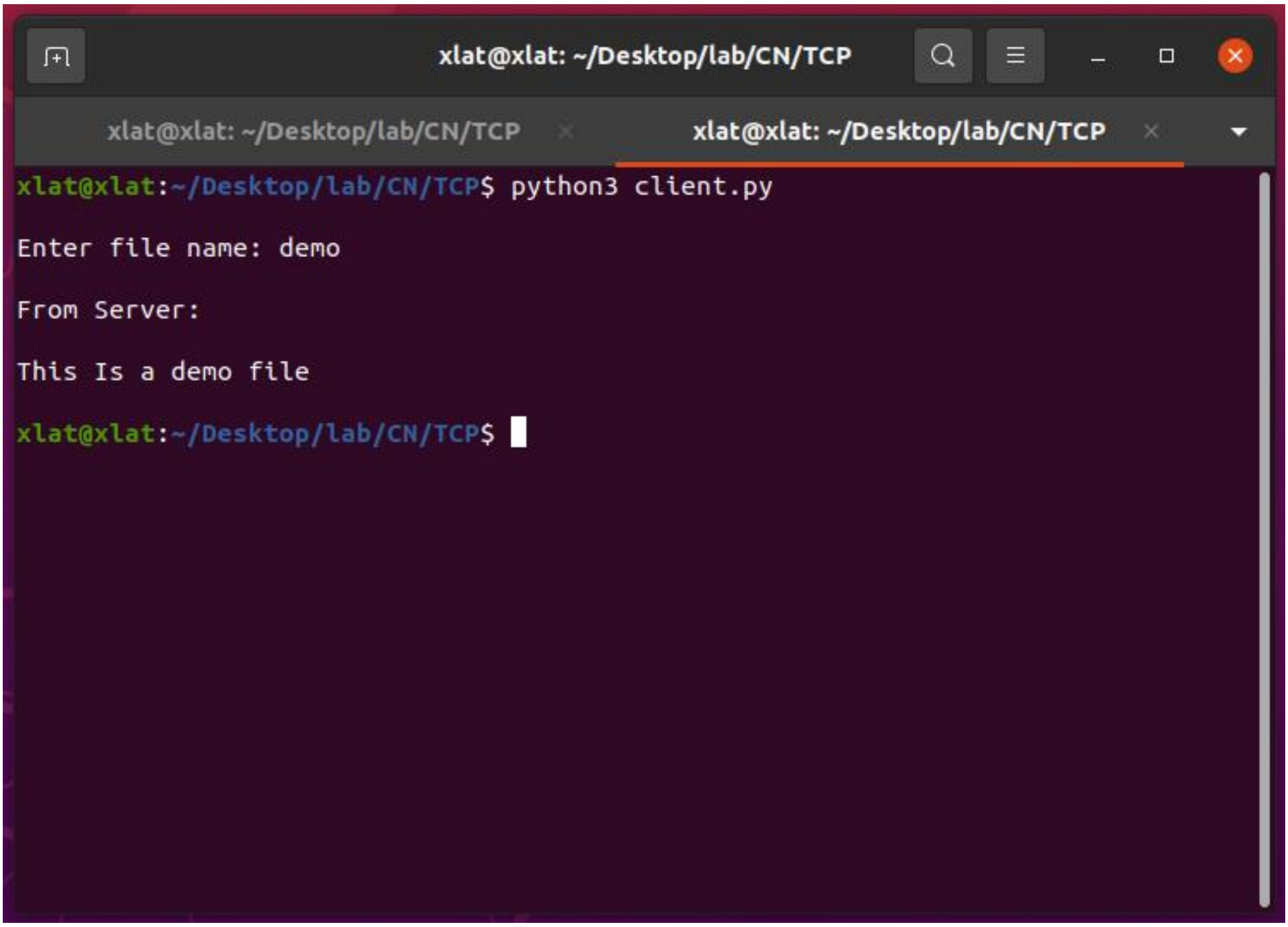
```
#Server.py
from socket import *
serverName=”127.0.0.1”
serverPort = 12000
serverSocket = socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
print ("The server is ready to receive")
while 1:
        connectionSocket, addr = serverSocket.accept()
        sentence = connectionSocket.recv(1024).decode()
        file=open(sentence,"r")
        l=file.read(1024)
        connectionSocket.send(l.encode())
        file.close()
        connectionSocket.close()
```

Output:


xlat@xlat: ~/Desktop/lab/CN/TCP
xlat@xlat: ~/Desktop/lab/CN/TCP
xlat@xlat: ~/Desktop/lab/CN/TCP

```
xlat@xlat:~$ cd Desktop/lab/CN/TCP
xlat@xlat:~/Desktop/lab/CN/TCP$ python3 server.py
The server is ready to receive

Sent contents of demo
The server is ready to receive
```


xlat@xlat: ~/Desktop/lab/CN/TCP
xlat@xlat: ~/Desktop/lab/CN/TCP
xlat@xlat: ~/Desktop/lab/CN/TCP

```
xlat@xlat:~/Desktop/lab/CN/TCP$ python3 client.py

Enter file name: demo

From Server:

This Is a demo file

xlat@xlat:~/Desktop/lab/CN/TCP$
```

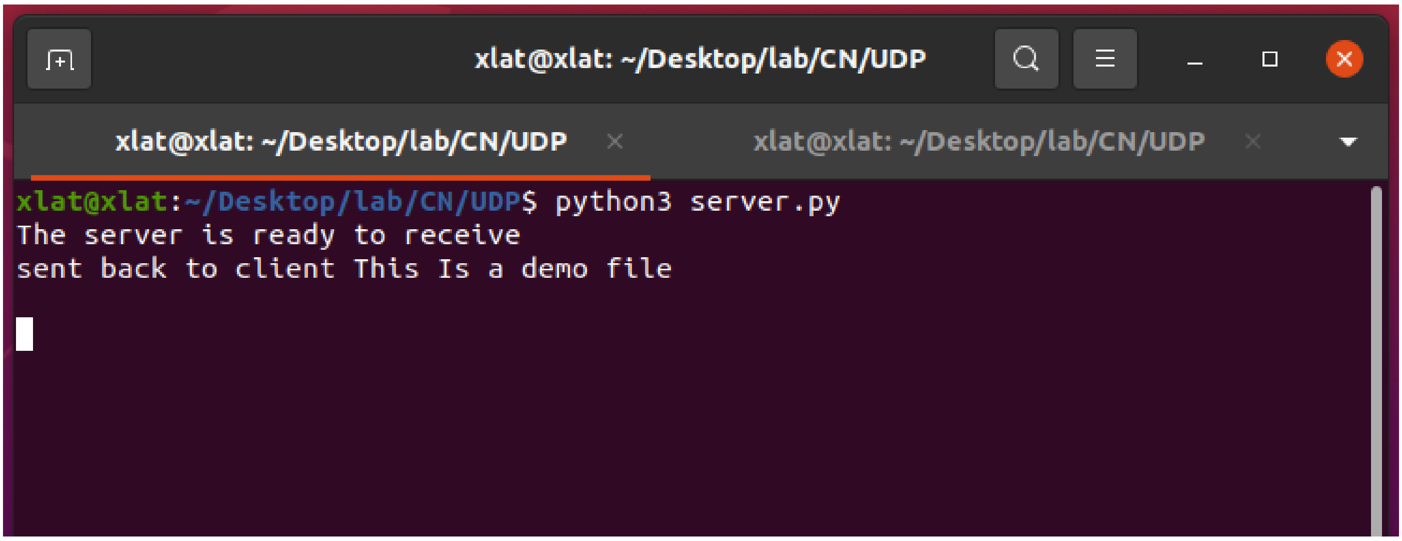
6 Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

Program:

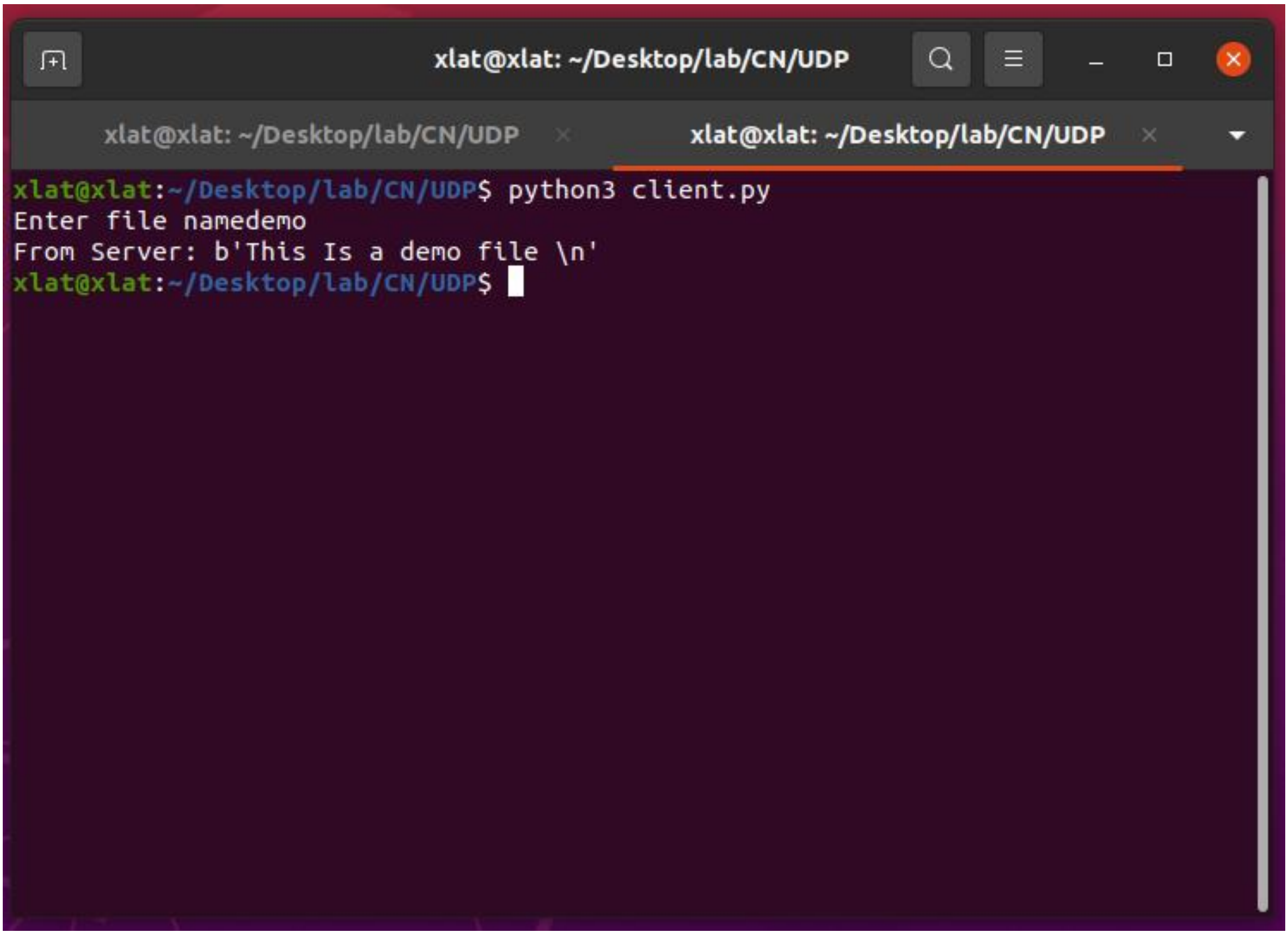
```
#ClientUDP.py
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
sentence = input("Enter file name")
clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))
filecontents,serverAddress = clientSocket.recvfrom(2048)
print ('From 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 server.py
The server is ready to receive
sent back to client This Is a demo file
```


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$ 
```