CN Lab Cycle 2

Aruna Ravi K R

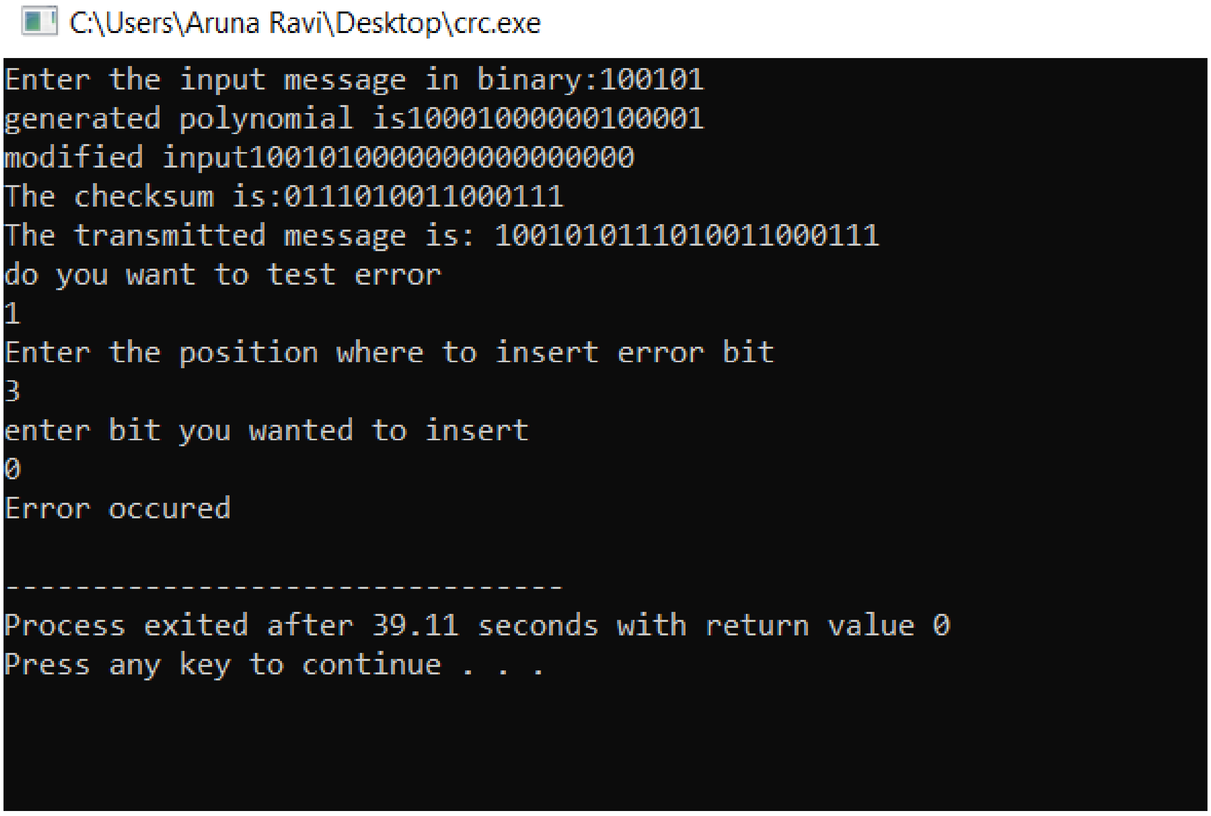
1BM19CS225

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

Program:

```
#include
<iostream>
#include <string.h>

using namespace std;

int crc(char *ip, char *op, char *poly, int mode)
{
    strcpy(op, ip);
    if (mode) {
        for (int i = 1; i < strlen(poly); i++)
            strcat(op, "0");
    cout << "modified input" << op <<endl;
    }
    for (int i = 0; i < strlen(ip); i++) {
        if (op[i] == '1') {
            for (int j = 0; j < strlen(poly); j++) {
                if (op[i + j] == poly[j])
                    op[i + j] = '0';
                else
                    op[i + j] = '1';
            }
        }
    }
    for (int i = 0; i < strlen(op); i++)
        if (op[i] == '1')
            return 0;
    return 1;
}


int main()
{
    char ip[50], op[50], recv[50];
    char poly[] = "10001000000100001";
    int choice;
    cout << "Enter the input message in binary:";
    cin >> ip;
    cout << "generated polynomial is" << poly <<endl;
    crc(ip, op, poly, 1);
    cout<<"The checksum is:"<<op+strlen(ip)<<endl;
    cout << "The transmitted message is: " << ip << op + strlen(ip) << endl;
    cout << "do you want to test error" << endl;
    cin >> choice;
    if(choice == 1)
    {
        int pos,n;
        char cp[50];
        strcmp(cp, op);
            cout<<"Enter the position where to insert error bit"<<endl;
            cin>>pos;
            cout << "enter bit you wanted to insert" <<endl;
            cin >> n;
            cp[pos]=n;
            if(!strcmp(op, cp))
                {
                    cout << "No error"<<endl;
                }
            else
                {
                    cout << "Error occured"<<endl;
                }
            return 0;
        }
        else{ cout << ""<<endl;}
    cout << "Enter the recevied message in binary" << endl;
    cin >> recv;
    if (crc(recv, op, poly, 0))
      cout << "No error in data" << endl;
    else

      cout << "Error in data transmission has occurred" << endl;

    return 0;
}
```

Output:


C:\Users\Aruna Ravi\Desktop\crc.exe

```
Enter the input message in binary:100101
generated polynomial is10001000000100001
modified input1001010000000000000000
The checksum is:0111010011000111
The transmitted message is: 1001010111010011000111
do you want to test error
1
Enter the position where to insert error bit
3
enter bit you wanted to insert
0
Error occured

--------------------------------
Process exited after 39.11 seconds with return value 0
Press any key to continue . . .
```

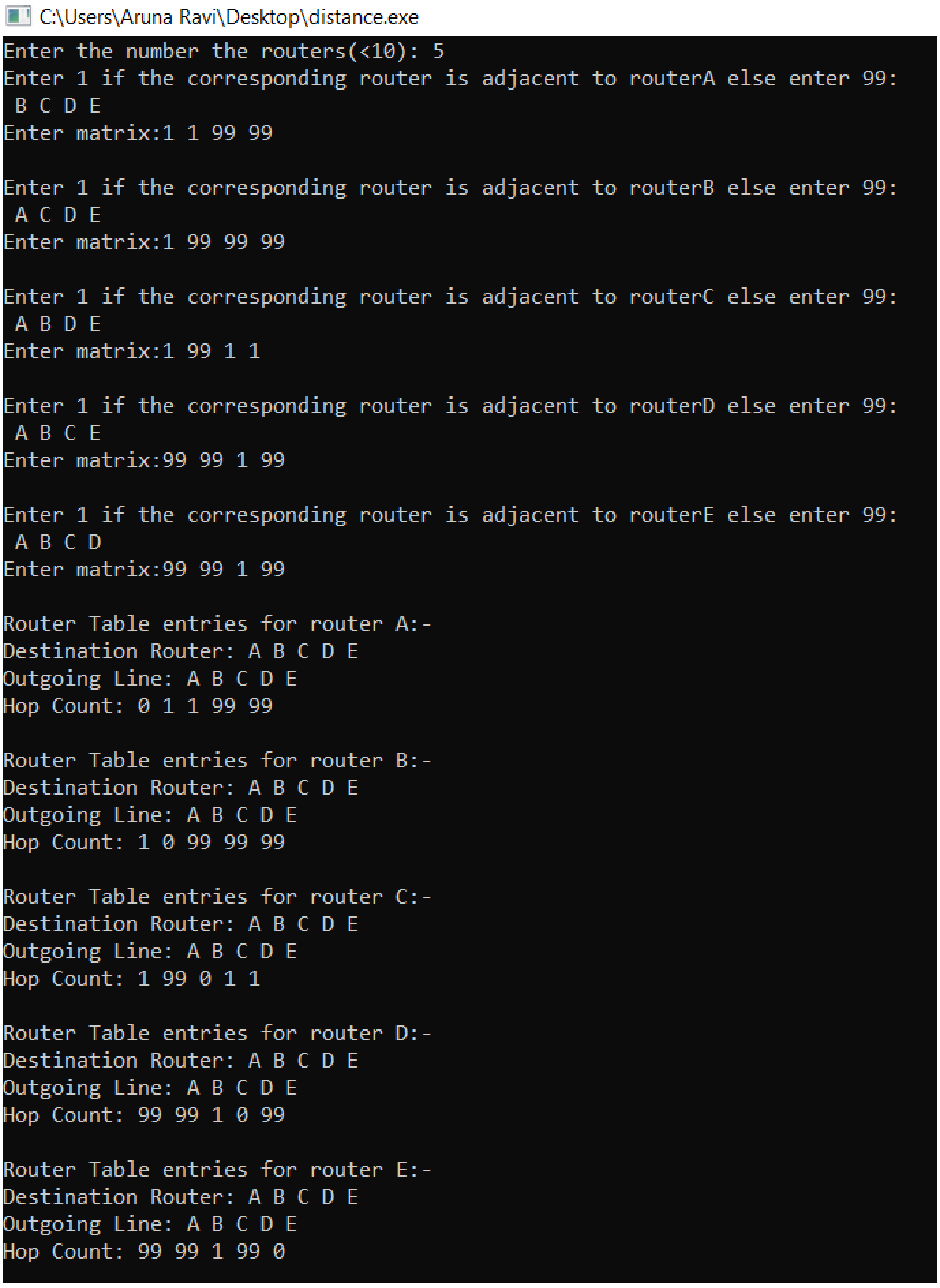
2) Write a program for distance vector algorithm to find suitable path for transmission.

Program:

```
#include
<bits/stdc++.h>
using namespace std;
#define MAX 10
int n;
class router {
char adj_new[MAX], adj_old[MAX];
int table_new[MAX], table_old[MAX];
 public:
 router( ){
for(int i=0;i<MAX;i++) table_old[i]=table_new[i]=99;
 }
void copy( ){
for(int i=0;i<n;i++) {
 adj_old[i] =adj_new[i];
 table_old[i]=table_new[i];
 }
 }
int equal( ) {
for(int i=0;i<n;i++)
if(table_old[i]!=table_new[i]||adj_new[i]!=adj_old[i])return 0;
return 1;
 }
void input(int j) {
 cout<<"Enter 1 if the corresponding router is adjacent to router"
<<(char)('A'+j)<<" else enter 99: "<<endl<<" ";
for(int i=0;i<n;i++)
if(i!=j) cout<<(char)('A'+i)<<" ";
 cout<<"\nEnter matrix:";
for(int i=0;i<n;i++) {
if(i==j)
 table_new[i]=0;
else
 cin>>table_new[i];
 adj_new[i]= (char)('A'+i);
 }
 cout<<endl;
 }
void display(){
 cout<<"\nDestination Router: ";
for(int i=0;i<n;i++) cout<<(char)('A'+i)<<" ";
 cout<<"\nOutgoing Line: ";
for(int i=0;i<n;i++) cout<<adj_new[i]<<" ";
 cout<<"\nHop Count: ";
for(int i=0;i<n;i++) cout<<table_new[i]<<" ";
 }
void build(int j) {
for(int i=0;i<n;i++)
for(int k=0;(i!=j)&&(k<n);k++)
if(table_old[i]!=99)
if((table_new[i]+table_new[k])<table_new[k]) {
 table_new[k]=table_new[i]+table_new[k];
 adj_new[k]=(char)('A'+i);
 }
 }
} r[MAX];
void build_table( ) {
int i=0, j=0;
while(i!=n) {
for(i=j;i<n;i++) {
 r[i].copy();
 r[i].build(i);
 }
```

```
for(i=0;i<n;i++)
if(!r[i].equal()) {
 j=i;
break;
 }
 }
}
int main() {
 cout<<"Enter the number the routers(<"<<MAX<<"): "; cin>>n;
for(int i=0;i<n;i++) r[i].input(i);
 build_table();
for(int i=0;i<n;i++) {
 cout<<"Router Table entries for router "<<(char)('A'+i)<<":-";
 r[i].display();
 cout<<endl<<endl;
 }
}
```

Output:


C:\Users\Aruna Ravi\Desktop\distance.exe

```
Enter the number the routers(<10): 5
Enter 1 if the corresponding router is adjacent to routerA else enter 99:
 B C D E
Enter matrix:1 1 99 99

Enter 1 if the corresponding router is adjacent to routerB else enter 99:
 A C D E
Enter matrix:1 99 99 99

Enter 1 if the corresponding router is adjacent to routerC else enter 99:
 A B D E
Enter matrix:1 99 1 1

Enter 1 if the corresponding router is adjacent to routerD else enter 99:
 A B C E
Enter matrix:99 99 1 99

Enter 1 if the corresponding router is adjacent to routerE else enter 99:
 A B C D
Enter matrix:99 99 1 99

Router Table entries for router A:-
Destination Router: A B C D E
Outgoing Line: A B C D E
Hop Count: 0 1 1 99 99

Router Table entries for router B:-
Destination Router: A B C D E
Outgoing Line: A B C D E
Hop Count: 1 0 99 99 99

Router Table entries for router C:-
Destination Router: A B C D E
Outgoing Line: A B C D E
Hop Count: 1 99 0 1 1

Router Table entries for router D:-
Destination Router: A B C D E
Outgoing Line: A B C D E
Hop Count: 99 99 1 0 99

Router Table entries for router E:-
Destination Router: A B C D E
Outgoing Line: A B C D E
Hop Count: 99 99 1 99 0
```

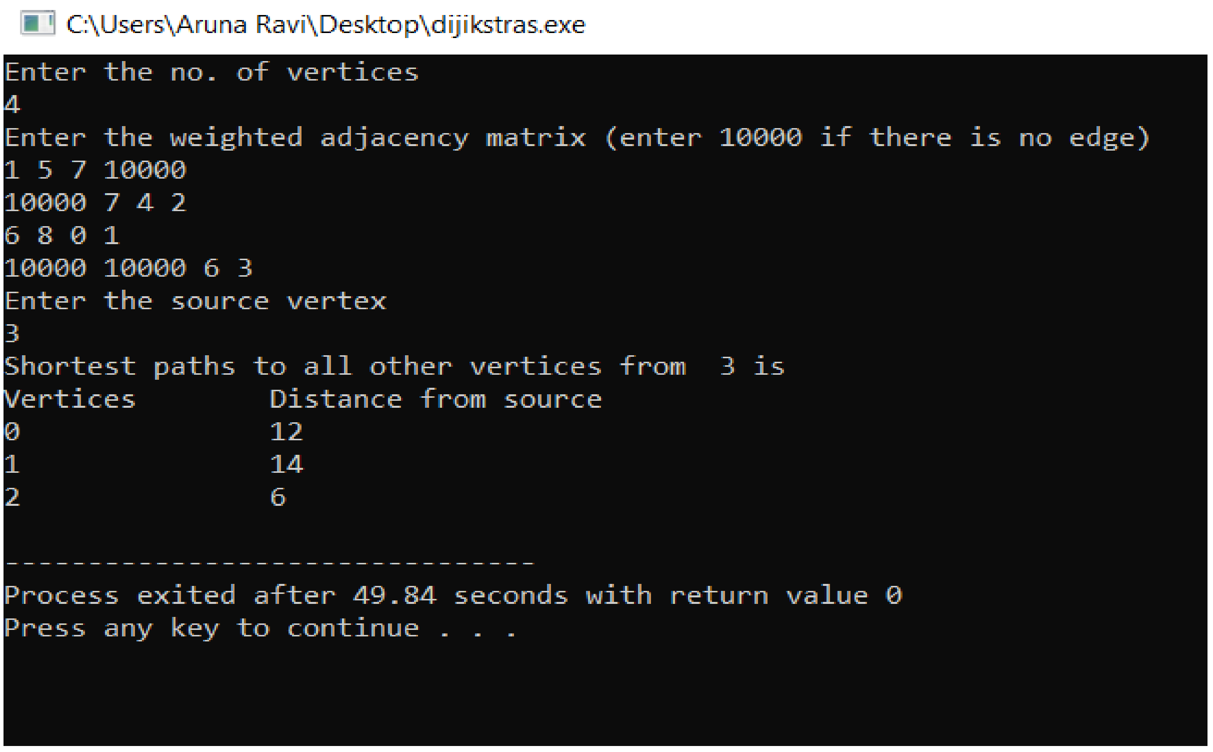
3) Implement Dijkstra’s algorithm to compute the shortest path for a given topology.

Program:

```
#include<iostream>
#include<climits>
using namespace std;
int a[30][30],n;
int minimum(int visited[],int dist[])
{
        int mindis=10000, mini;
        for(int i=0;i<n;i++)
        {
                if(!visited[i] && dist[i]<mindis)
                {
                        mindis=dist[i];
                        mini=i;
                }
        }
        return mini;
}

void dijkstra(int src)
{
        int dist[n],visited[n];

        for(int i=0;i<n;i++)
        {
                dist[i]=10000;
                visited[i]=0;
        }
        dist[src]=0;
        for(int i=0;i<n-1;i++)
        {
                int u=minimum(visited,dist);
                visited[u]=1;
                for(int v=0;v<n;v++)
                {
                        if(!visited[v] && a[u][v]!=10000 &&
dist[u]!=10000 && (dist[u]+a[u][v])<dist[v])
                                dist[v]=dist[u]+a[u][v];
                }
        }
        cout<<"Shortest paths to all other vertices from  "<<src<<"
is "<<endl;
```

```
		cout<<"Vertices\tDistance from source"<<endl;
		for(int i=0;i<n;i++)
		{
			if(i!=src)
				cout<<i<<"\t\t"<<dist[i]<<endl;
		}
	}

	int main()
	{
		cout<<"Enter the no. of vertices"<<endl;
		cin>>n;
		cout<<"Enter the weighted adjacency matrix (enter 10000
	if there is no edge)"<<endl;
		for(int i=0;i<n;i++)
		{
			for(int j=0;j<n;j++)
				cin>>a[i][j];
		}
		int src;
		cout<<"Enter the source vertex"<<endl;
		cin>>src;
		dijkstra(src);
		return 0;
	}
```

Output:



C:\Users\Aruna Ravi\Desktop\dijikstras.exe

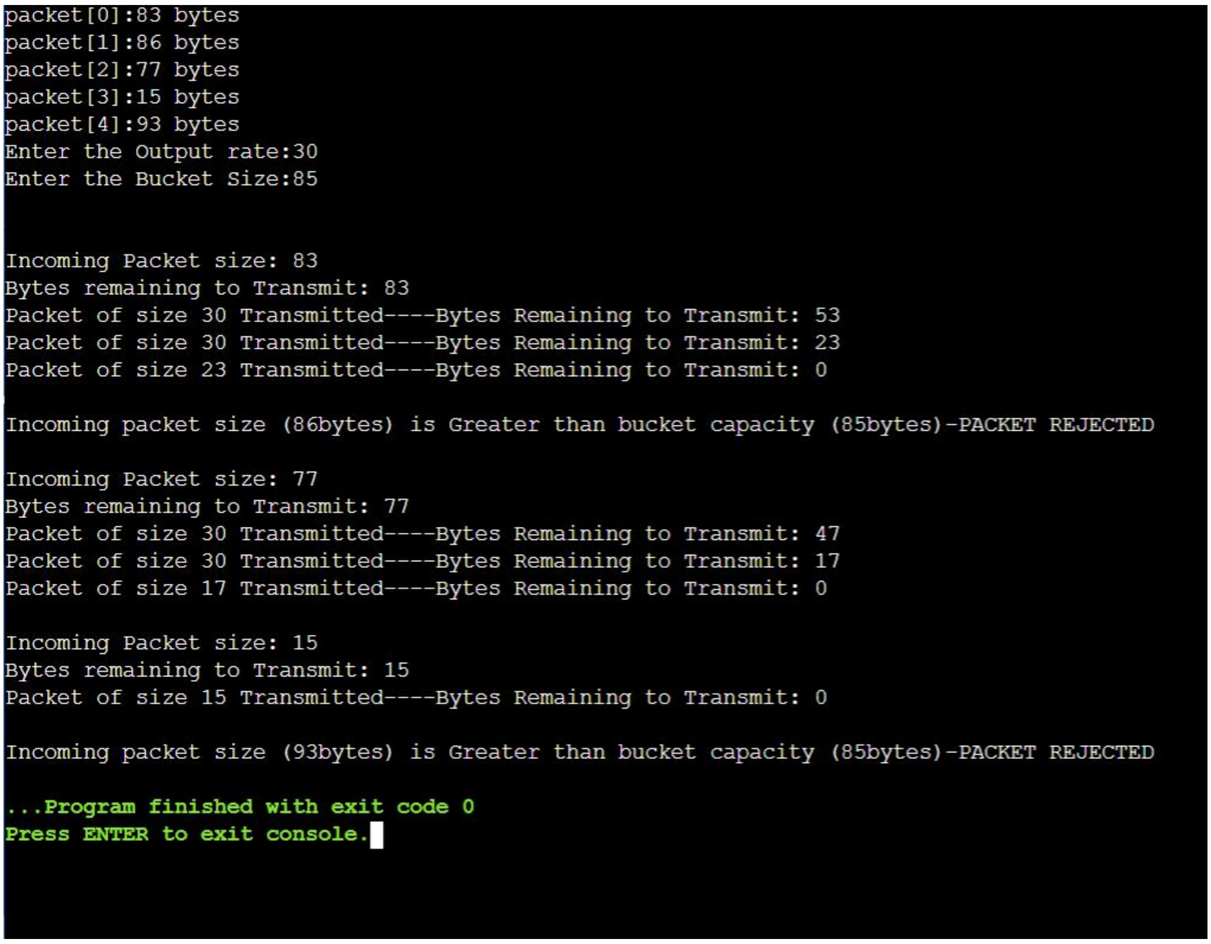
```
Enter the no. of vertices
4
Enter the weighted adjacency matrix (enter 10000 if there is no edge)
1 5 7 10000
10000 7 4 2
6 8 0 1
10000 10000 6 3
Enter the source vertex
3
Shortest paths to all other vertices from  3 is
Vertices        Distance from source
0               12
1               14
2               6

--------------------------------
Process exited after 49.84 seconds with return value 0
Press any key to continue . . .
```

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

Program:

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>

#define NOF_PACKETS 5
int main()
{
    int packet_sz[NOF_PACKETS], i, clk, b_size, o_rate, p_sz_rm=0, p_sz, p_time, op;
    for(i = 0; i<NOF_PACKETS; ++i)
        packet_sz[i] = random() % 100;
    for(i = 0; i<NOF_PACKETS; ++i)
        printf("\npacket[%d]:%d bytes\t", i, packet_sz[i]);
    printf("\nEnter the Output rate:");
    scanf("%d", &o_rate);
    printf("Enter the Bucket Size:");
    scanf("%d", &b_size);
    for(i = 0; i<NOF_PACKETS; ++i)
    {
        if( (packet_sz[i] + p_sz_rm) > b_size)
            if(packet_sz[i] > b_size)/*compare the packet siz with bucket size*/
                printf("\n\nIncoming packet size (%dbytes) is Greater than bucket capacity
(%dbytes)-PACKET REJECTED", packet_sz[i], b_size);
            else
                printf("\n\nBucket capacity exceeded-PACKETS REJECTED!!");
        else
        {
            p_sz_rm += packet_sz[i];
            printf("\n\nIncoming Packet size: %d", packet_sz[i]);
            printf("\nBytes remaining to Transmit: %d", p_sz_rm);
            //p_time = random() * 10;
            //printf("\nTime left for transmission: %d units", p_time);
            //for(clk = 10; clk <= p_time; clk += 10)
            while(p_sz_rm>0)
            {
                sleep(1);
                if(p_sz_rm)
                {
                    if(p_sz_rm <= o_rate)/*packet size remaining comparing with output rate*/
                        op = p_sz_rm, p_sz_rm = 0;
                    else
                        op = o_rate, p_sz_rm -= o_rate;
printf("\nPacket of size %d Transmitted", op);
                    printf("----Bytes Remaining to Transmit: %d", p_sz_rm);
                }
                else
                {
                     printf("\nNo packets to transmit!!");
                }
            }
        }
    }
}
```

Output:



```
packet[0]:83 bytes
packet[1]:86 bytes
packet[2]:77 bytes
packet[3]:15 bytes
packet[4]:93 bytes
Enter the Output rate:30
Enter the Bucket Size:85


Incoming Packet size: 83
Bytes remaining to Transmit: 83
Packet of size 30 Transmitted----Bytes Remaining to Transmit: 53
Packet of size 30 Transmitted----Bytes Remaining to Transmit: 23
Packet of size 23 Transmitted----Bytes Remaining to Transmit: 0

Incoming packet size (86bytes) is Greater than bucket capacity (85bytes)-PACKET REJECTED

Incoming Packet size: 77
Bytes remaining to Transmit: 77
Packet of size 30 Transmitted----Bytes Remaining to Transmit: 47
Packet of size 30 Transmitted----Bytes Remaining to Transmit: 17
Packet of size 17 Transmitted----Bytes Remaining to Transmit: 0

Incoming Packet size: 15
Bytes remaining to Transmit: 15
Packet of size 15 Transmitted----Bytes Remaining to Transmit: 0

Incoming packet size (93bytes) is Greater than bucket capacity (85bytes)-PACKET REJECTED

...Program finished with exit code 0
Press ENTER to exit console.
```

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.

Server Program:

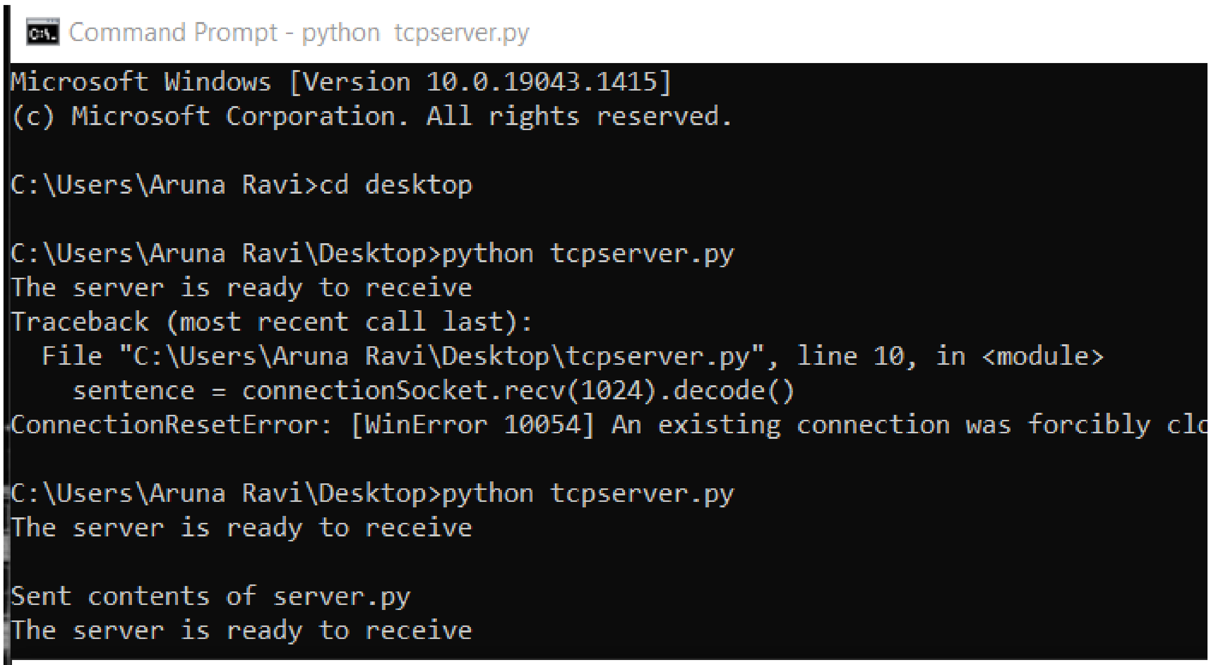
```
from socket import *
serverName="127.0.0.1"
serverPort = 12000
serverSocket = socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
    print ("The server is ready to receive")
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    file=open(sentence,"r")
    l=file.read(1024)

    connectionSocket.send(l.encode())
```

```
        print ('\nSent contents of ' + sentence)
        file.close()
        connectionSocket.close()
```

Client Program:

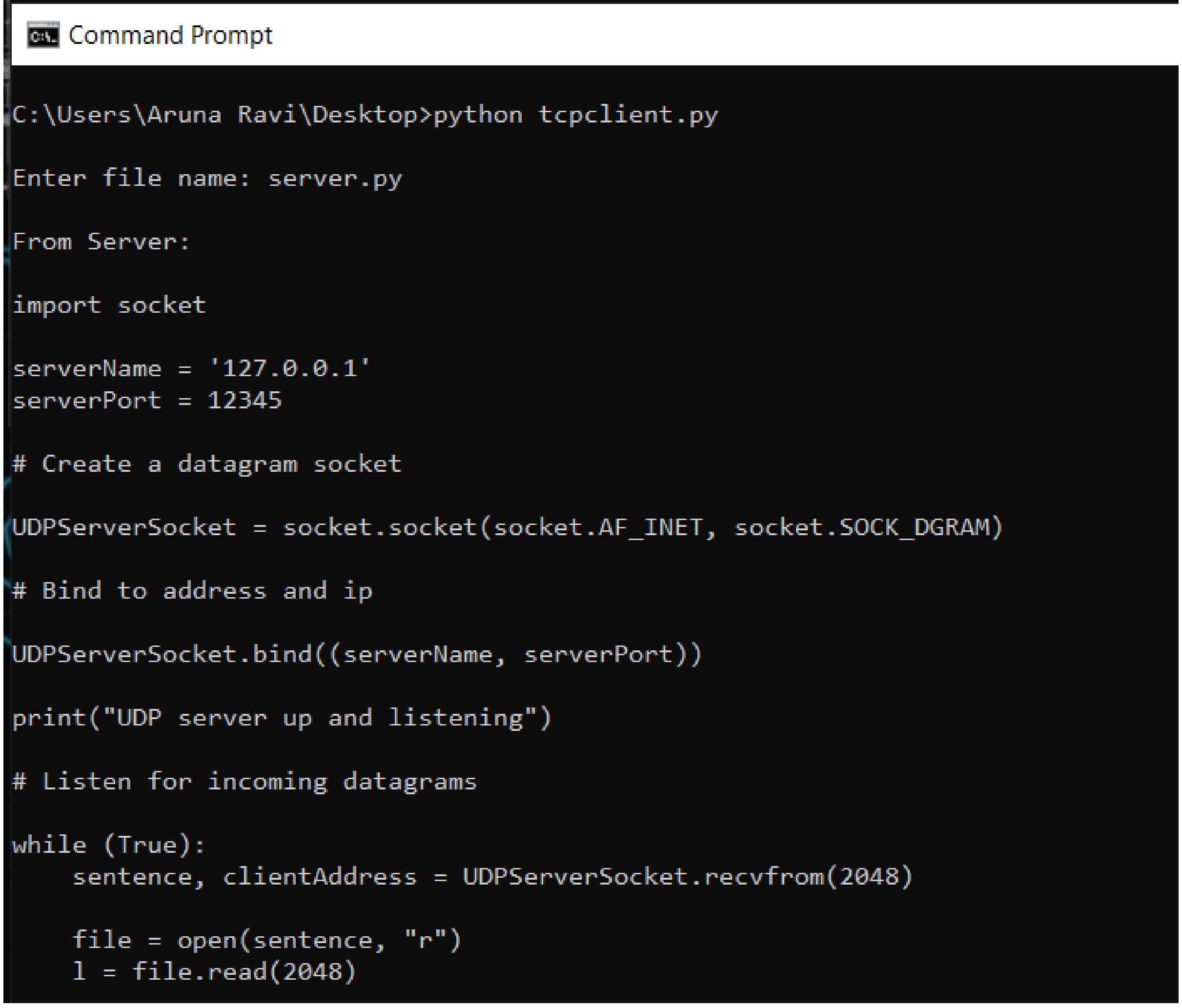
```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName,serverPort))
sentence = input("\nEnter file name: ")

clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print ('\nFrom Server:\n')
print(filecontents)
clientSocket.close()
```

Output:



Command Prompt - python tcpserver.py

```
Microsoft Windows [Version 10.0.19043.1415]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Aruna Ravi>cd desktop

C:\Users\Aruna Ravi\Desktop>python tcpserver.py
The server is ready to receive
Traceback (most recent call last):
  File "C:\Users\Aruna Ravi\Desktop\tcpserver.py", line 10, in <module>
    sentence = connectionSocket.recv(1024).decode()
ConnectionResetError: [WinError 10054] An existing connection was forcibly clo

C:\Users\Aruna Ravi\Desktop>python tcpserver.py
The server is ready to receive

Sent contents of server.py
The server is ready to receive
```



Command Prompt

```
C:\Users\Aruna Ravi\Desktop>python tcpclient.py

Enter file name: server.py

From Server:

import socket

serverName = '127.0.0.1'
serverPort = 12345

# Create a datagram socket

UDPServerSocket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)

# Bind to address and ip

UDPServerSocket.bind((serverName, serverPort))

print("UDP server up and listening")

# Listen for incoming datagrams

while (True):
    sentence, clientAddress = UDPServerSocket.recvfrom(2048)

    file = open(sentence, "r")
    l = file.read(2048)
```

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.

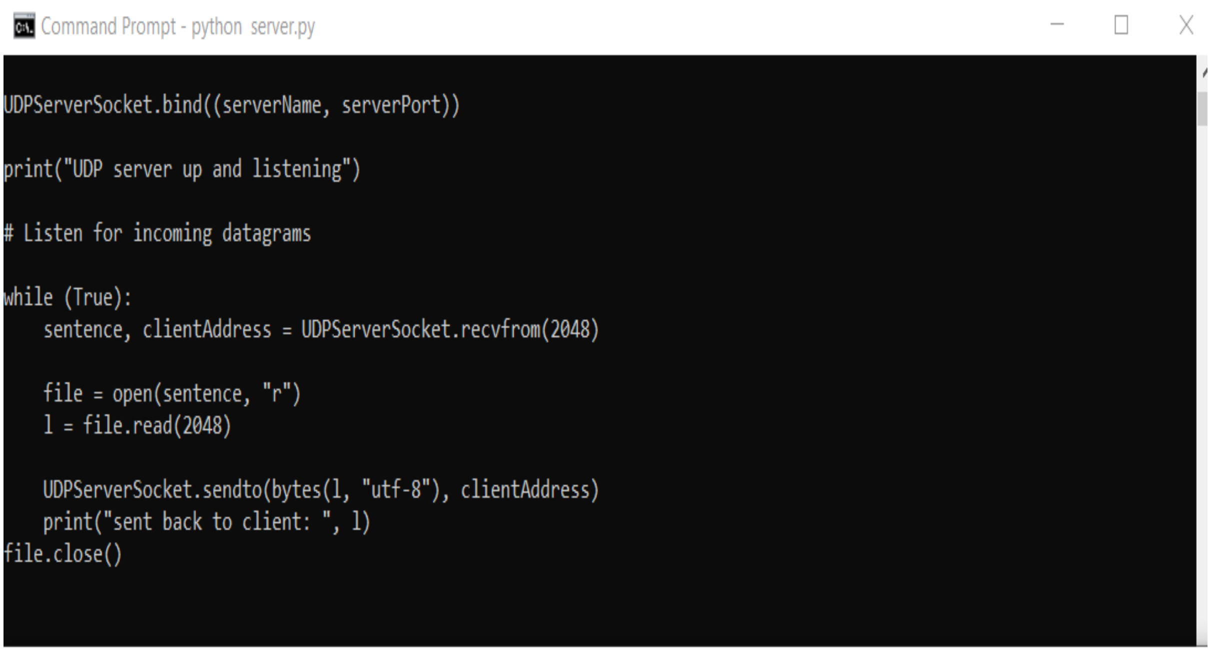
Server Program:

```
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)
    sentence = sentence.decode("utf-8")
    file=open(sentence,"r")
    l=file.read(2048)

    serverSocket.sendto(bytes(l,"utf-8"),clientAddress)

    print ('\nSent contents of ', end = ' ')
    print (sentence)
   #  for i in sentence:
      #  print (str(i), end = '')
    file.close()
```

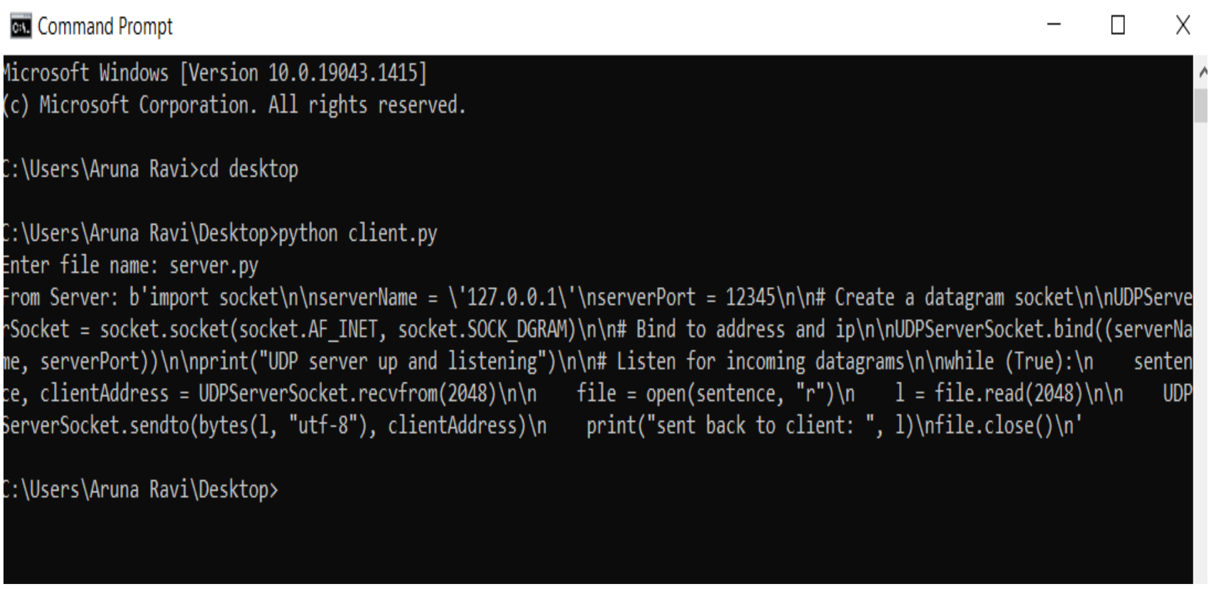
Client Program:

```
    from socket import *
    serverName = "127.0.0.1"
    serverPort = 12000
    clientSocket = socket(AF_INET, SOCK_DGRAM)

    sentence = input("\nEnter file name:  ")

    clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))

    filecontents,serverAddress = clientSocket.recvfrom(2048)
    print ('\nReply from Server:\n')
    print (filecontents.decode("utf-8"))
    # for i in filecontents:
       # print(str(i), end = '')
    clientSocket.close()
clientSocket.close()
```

Output:



```
UDPServerSocket.bind((serverName, serverPort))

print("UDP server up and listening")

# Listen for incoming datagrams

while (True):
    sentence, clientAddress = UDPServerSocket.recvfrom(2048)

    file = open(sentence, "r")
    l = file.read(2048)

    UDPServerSocket.sendto(bytes(l, "utf-8"), clientAddress)
    print("sent back to client: ", l)
file.close()
```



```
icrosoft Windows [Version 10.0.19043.1415]
(c) Microsoft Corporation. All rights reserved.

:\Users\Aruna Ravi>cd desktop

:\Users\Aruna Ravi\Desktop>python client.py
nter file name: server.py
rom Server: b'import socket\n\nserverName = \'127.0.0.1\'\nserverPort = 12345\n\n# Create a datagram socket\n\nUDPServe
Socket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)\n\n# Bind to address and ip\n\nUDPServerSocket.bind((serverNa
e, serverPort))\n\nprint("UDP server up and listening")\n\n# Listen for incoming datagrams\n\nwhile (True):\n    senten
e, clientAddress = UDPServerSocket.recvfrom(2048)\n\n    file = open(sentence, "r")\n    l = file.read(2048)\n\n    UDP
erverSocket.sendto(bytes(l, "utf-8"), clientAddress)\n    print("sent back to client: ", l)\nfile.close()\n'

:\Users\Aruna Ravi\Desktop>
```