CN LAB RECORD (CYCLE 2)

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1BM19CS112

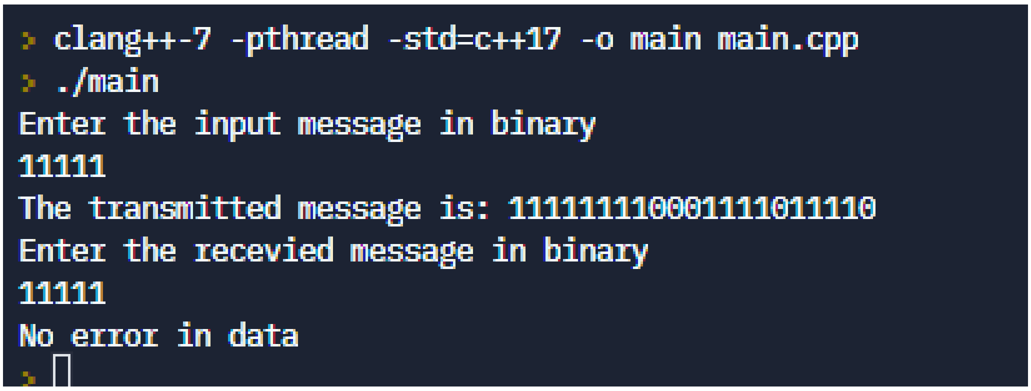
5-C

LAB-1

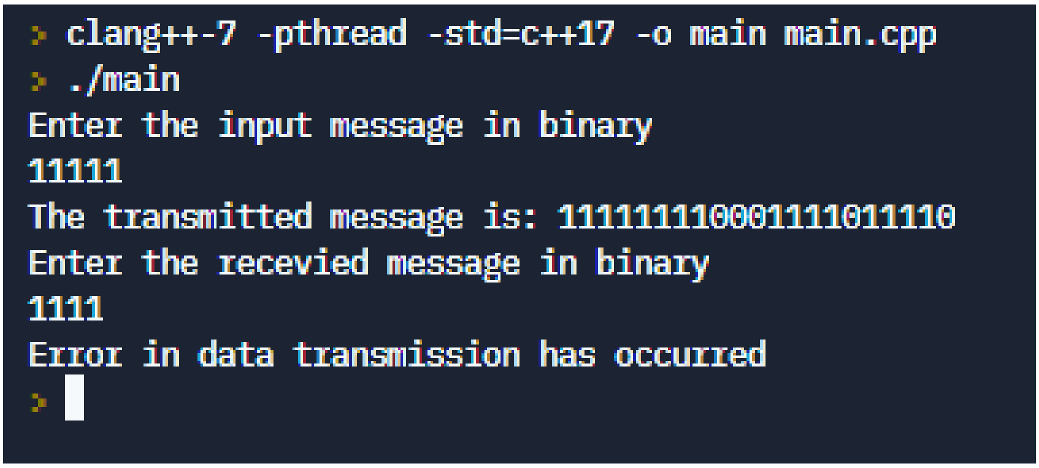
1. **Write a program for error detecting code using CRC-CCITT (16 BITS).**
   i) **Program**

```
#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");
    }
    /* Perform XOR on the msg with the selected polynomial */
    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';
            }
        }
    }
    /* check for errors. return 0 if error detected */
    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";

    cout << "Enter the input message in binary"<< endl;
    cin >> ip;
    crc(ip, op, poly, 1);
    cout << "The transmitted message is: " << ip << op + strlen(ip) << 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;
}
```

ii) Output



```
› clang++-7 -pthread -std=c++17 -o main main.cpp
› ./main
Enter the input message in binary
11111
The transmitted message is: 1111111100011110111l0
Enter the recevied message in binary
11111
No error in data
›
```



```
› clang++-7 -pthread -std=c++17 -o main main.cpp
› ./main
Enter the input message in binary
11111
The transmitted message is: 1111111100011110111l0
Enter the recevied message in binary
1111
Error in data transmission has occurred
›
```

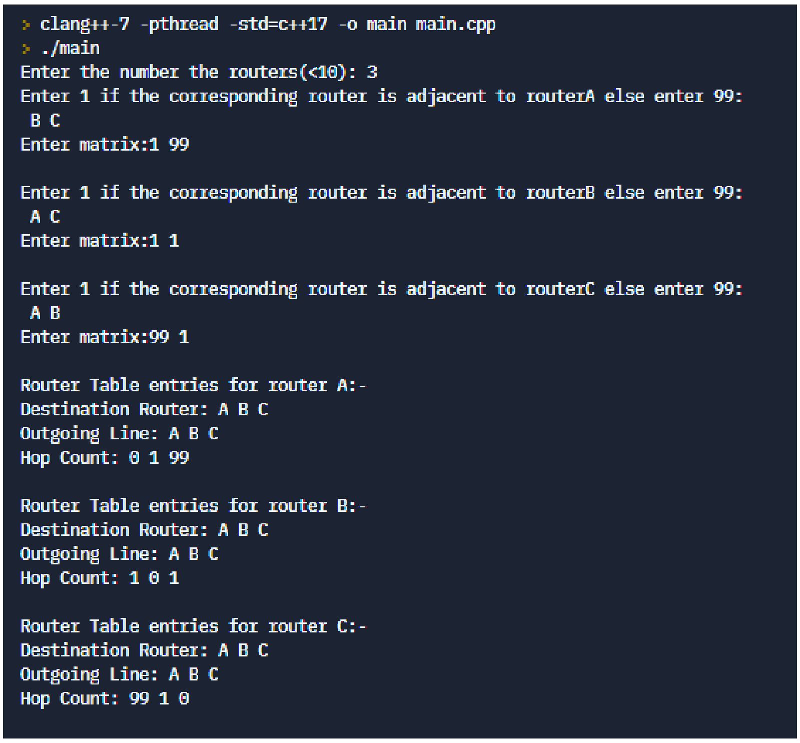
LAB-2

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

i. 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;
 }
}
```

ii. Output



```
> clang++-7 -pthread -std=c++17 -o main main.cpp
> ./main
Enter the number the routers(<10): 3
Enter 1 if the corresponding router is adjacent to routerA else enter 99:
 B C
Enter matrix:1 99

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

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

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

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

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

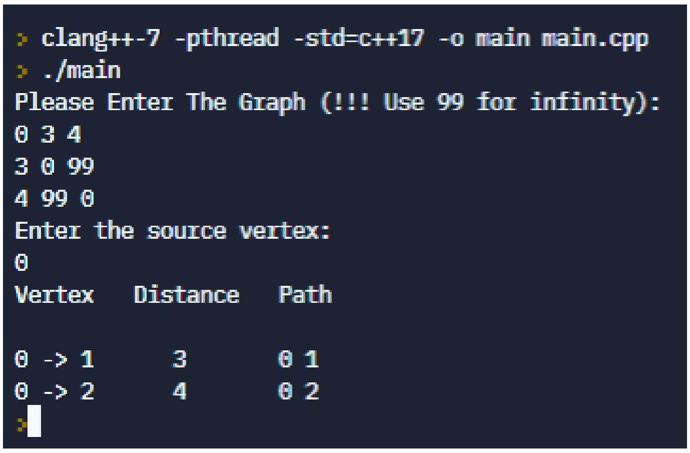
LAB-3

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

   i. **Program**

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

#define V 3

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 \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<<"Please Enter The Graph (!!! Use 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 vertex: "<<endl;
    int src;
    cin>>src;

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

ii. Output



```
> clang++-7 -pthread -std=c++17 -o main main.cpp
> ./main
Please Enter The Graph (!!! Use 99 for infinity):
0 3 4
3 0 99
4 99 0
Enter the source vertex:
0
Vertex   Distance   Path

0 -> 1      3       0 1
0 -> 2      4       0 2
>
```

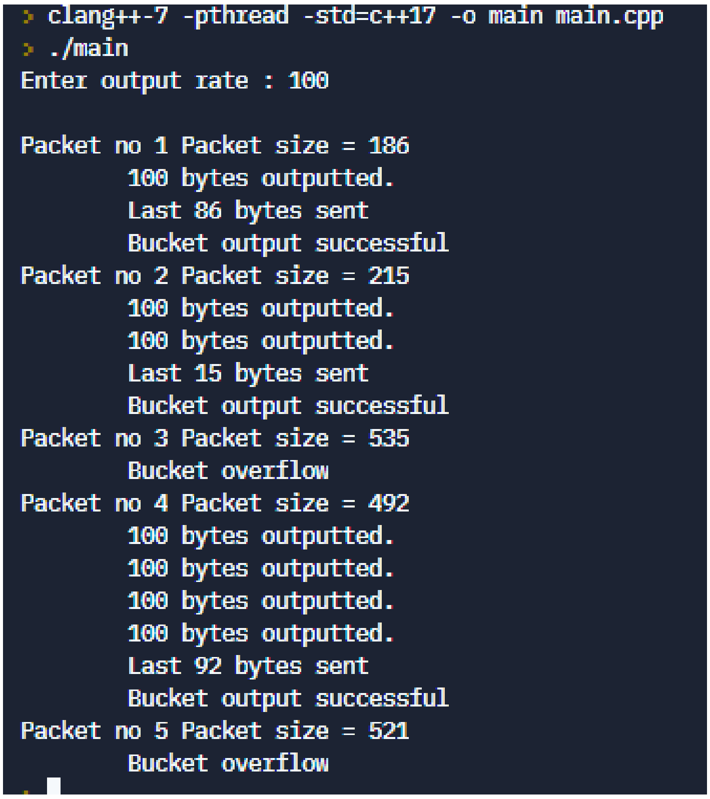
LAB-4

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

i. 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;
}
```

ii. Output



```
› clang++-7 -pthread -std=c++17 -o main main.cpp
› ./main
Enter output rate : 100

Packet no 1 Packet size = 186
        100 bytes outputted.
        Last 86 bytes sent
        Bucket output successful
Packet no 2 Packet size = 215
        100 bytes outputted.
        100 bytes outputted.
        Last 15 bytes sent
        Bucket output successful
Packet no 3 Packet size = 535
        Bucket overflow
Packet no 4 Packet size = 492
        100 bytes outputted.
        100 bytes outputted.
        100 bytes outputted.
        100 bytes outputted.
        Last 92 bytes sent
        Bucket output successful
Packet no 5 Packet size = 521
        Bucket overflow
›
```

LAB-5

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.**

   i. **Program**

   ServerTCP.ipynb

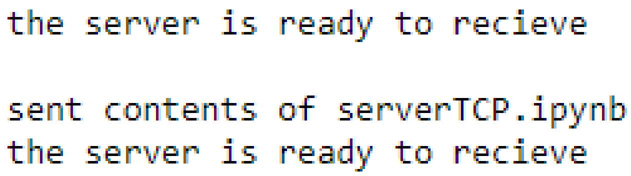
```
from socket import *
serverName="127.0.0.1"
serverPort=12000
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
   print("the server is ready to recieve")
   connectionSocket,addr=serverSocket.accept()
   sentence=connectionSocket.recv(1024).decode()

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

   connectionSocket.send(l.encode())
   print('\nsent contents of '+sentence)
   file.close()
   connectionSocket.close()
```

   clientTCP.ipynb

```
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()
```

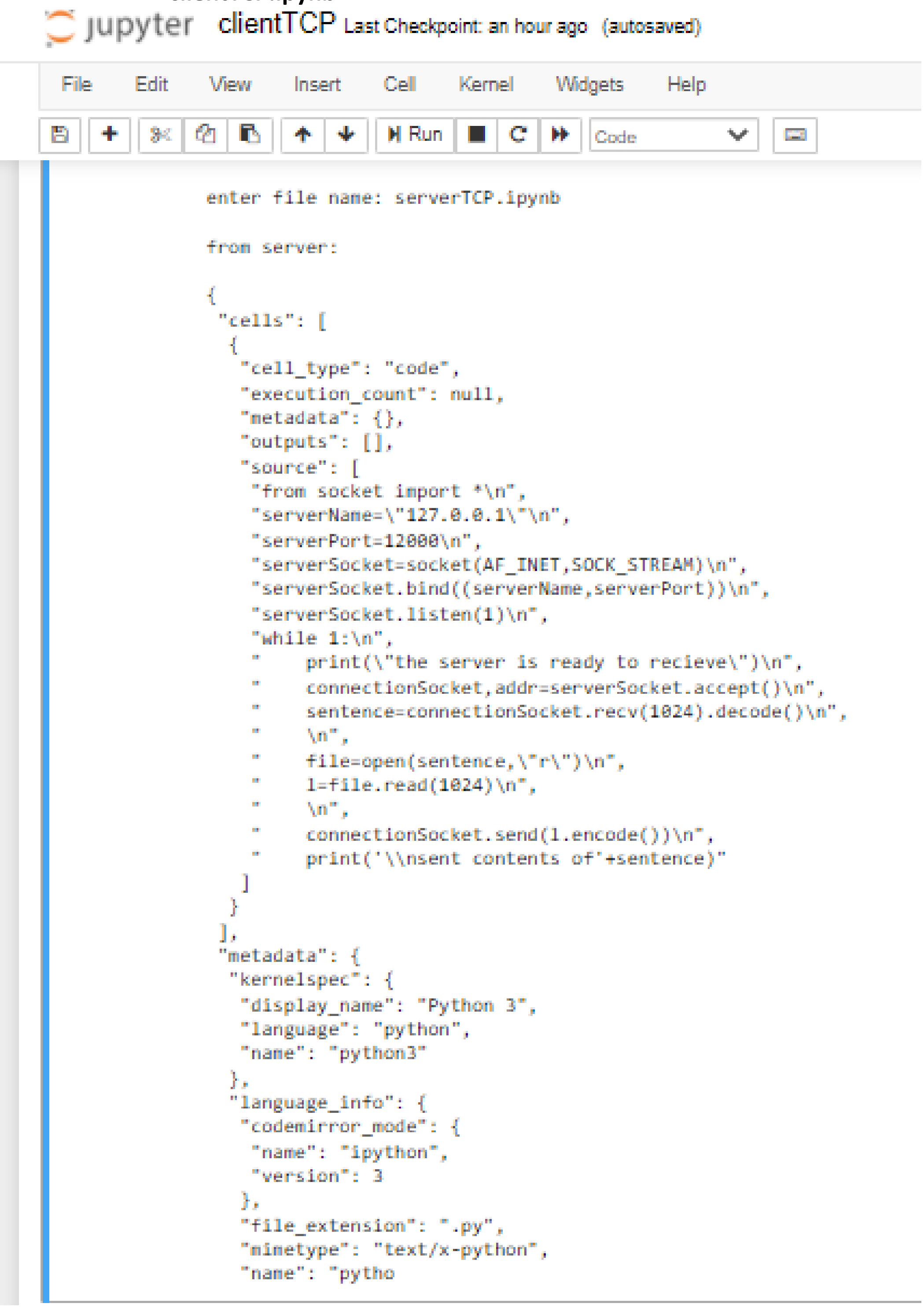
   ii. **Output**

   serverTCP.ipynb



```
the server is ready to recieve

sent contents of serverTCP.ipynb
the server is ready to recieve
```

clientTCP.ipynb



```
enter file name: serverTCP.ipynb

from server:

{
 "cells": [
  {
   "cell_type": "code",
   "execution_count": null,
   "metadata": {},
   "outputs": [],
   "source": [
    "from socket import *\n",
    "serverName=\"127.0.0.1\"\n",
    "serverPort=12000\n",
    "serverSocket=socket(AF_INET,SOCK_STREAM)\n",
    "serverSocket.bind((serverName,serverPort))\n",
    "serverSocket.listen(1)\n",
    "while 1:\n",
    "    print(\"the server is ready to recieve\")\n",
    "    connectionSocket,addr=serverSocket.accept()\n",
    "    sentence=connectionSocket.recv(1024).decode()\n",
    "    \n",
    "    file=open(sentence,\"r\")\n",
    "    l=file.read(1024)\n",
    "    \n",
    "    connectionSocket.send(l.encode())\n",
    "    print('\\nsent contents of'+sentence)"
   ]
  }
 ],
 "metadata": {
  "kernelspec": {
   "display_name": "Python 3",
   "language": "python",
   "name": "python3"
  },
  "language_info": {
   "codemirror_mode": {
    "name": "ipython",
    "version": 3
   },
   "file_extension": ".py",
   "mimetype": "text/x-python",
   "name": "pytho
```

LAB-6

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.**

    i. **Program**

ServerUDP.ipynb

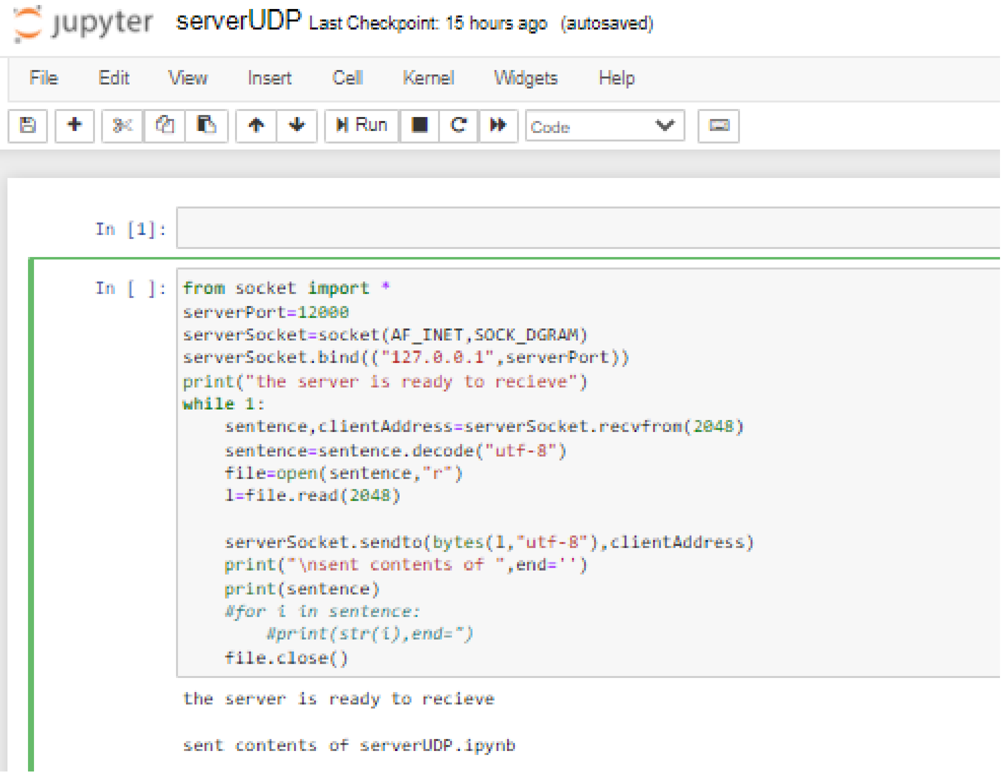
```
from socket import *
serverPort=12000
serverSocket=socket(AF_INET,SOCK_DGRAM)
serverSocket.bind(("127.0.0.1",serverPort))
print("the server is ready to recieve")
while 1:
   sentence,clientAddress=serverSocket.recvfrom(2048)
   sentence=sentence.decode("utf-8")
   file=open(sentence,"r")
   l=file.read(2048)

   serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
   print("\nsent contents of ",end='')
   print(sentence)
   #for i in sentence:
      #print(str(i),end=")
   file.close()
```

ClientUDP.ipynb

```
from socket import *
serverName="127.0.0.1"
serverPort=12000
clientSocket=socket(AF_INET,SOCK_DGRAM)
sentence=input("\nenter the 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()
```

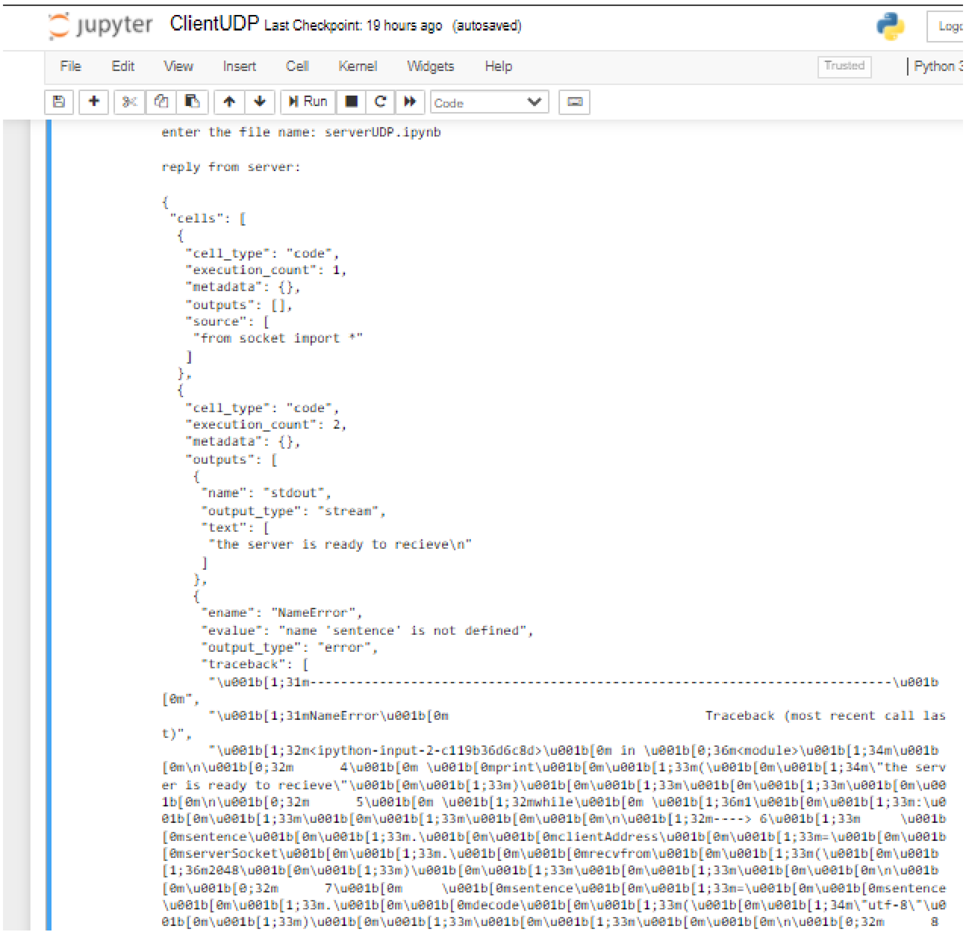
ii. Output

serverUDP.ipynb



```
In [1]:

In [ ]: from socket import *
        serverPort=12000
        serverSocket=socket(AF_INET,SOCK_DGRAM)
        serverSocket.bind(("127.0.0.1",serverPort))
        print("the server is ready to recieve")
        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()

        the server is ready to recieve

        sent contents of serverUDP.ipynb
```

clientUDP.ipynb



```
enter the file name: serverUDP.ipynb

reply from server:

{
 "cells": [
  {
   "cell_type": "code",
   "execution_count": 1,
   "metadata": {},
   "outputs": [],
   "source": [
    "from socket import *"
   ]
  },
  {
   "cell_type": "code",
   "execution_count": 2,
   "metadata": {},
   "outputs": [
    {
     "name": "stdout",
     "output_type": "stream",
     "text": [
      "the server is ready to recieve\n"
     ]
    },
    {
     "ename": "NameError",
     "evalue": "name 'sentence' is not defined",
     "output_type": "error",
     "traceback": [
      "\u001b[1;31m---------------------------------------------------------------------------\u001b
[0m",
      "\u001b[1;31mNameError\u001b[0m                                 Traceback (most recent call las
t)",
      "\u001b[1;32m<ipython-input-2-c119b36d6c8d>\u001b[0m in \u001b[0;36m<module>\u001b[1;34m\u001b
[0m\n\u001b[0;32m      4\u001b[0m \u001b[0mprint\u001b[0m\u001b[1;33m(\u001b[0m\u001b[1;34m\"the serv
er is ready to recieve\"\u001b[0m\u001b[1;33m)\u001b[0m\u001b[1;33m\u001b[0m\u001b[1;33m\u001b[0m\u00
1b[0m\n\u001b[0;32m      5\u001b[0m \u001b[1;32mwhile\u001b[0m \u001b[1;36m1\u001b[0m\u001b[1;33m:\u0
01b[0m\u001b[1;33m\u001b[0m\u001b[1;33m\u001b[0m\u001b[0m\n\u001b[1;32m----> 6\u001b[1;33m     \u001b
[0msentence\u001b[0m\u001b[1;33m.\u001b[0m\u001b[0mclientAddress\u001b[0m\u001b[1;33m=\u001b[0m\u001b
[0mserverSocket\u001b[0m\u001b[1;33m.\u001b[0m\u001b[0mrecvfrom\u001b[0m\u001b[1;33m(\u001b[0m\u001b
[1;36m2048\u001b[0m\u001b[1;33m)\u001b[0m\u001b[1;33m\u001b[0m\u001b[1;33m\u001b[0m\u001b[0m\n\u001b
[0m\u001b[0;32m      7\u001b[0m     \u001b[0msentence\u001b[0m\u001b[1;33m=\u001b[0m\u001b[0msentence
\u001b[0m\u001b[1;33m.\u001b[0m\u001b[0mdecode\u001b[0m\u001b[1;33m(\u001b[0m\u001b[1;34m\"utf-8\"\u0
01b[0m\u001b[1;33m)\u001b[0m\u001b[1;33m\u001b[0m\u001b[1;33m\u001b[0m\u001b[0m\n\u001b[0;32m      8
```