CN LAB CYCLE 2

1BM19CS150
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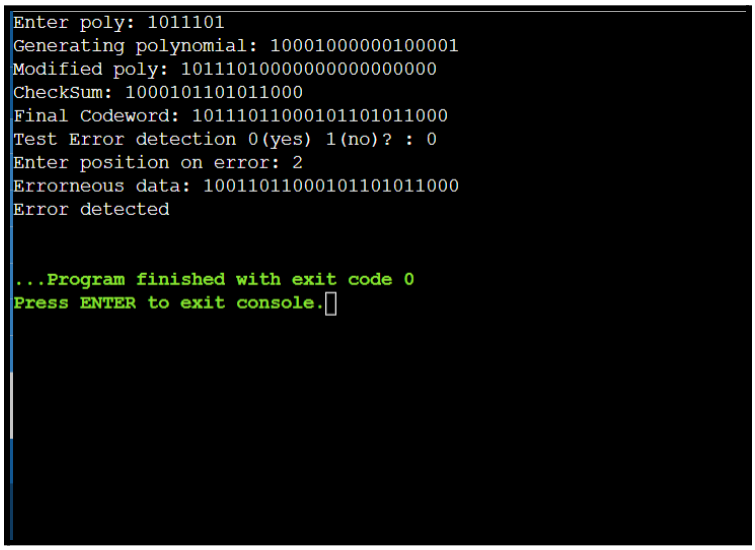
1. Write a program for error detecting code using CRC-CCITT (16 bits).

```
import java.util.*;
public class Main{
 public static int n;
 public static void main(String[] args){
 Scanner in=new Scanner(System.in);
 Main ob=new Main();
 String code, copy, rec,zero="0000000000000000";
 System.out.print("Enter poly: ");
 code=in.nextLine();
 System.out.println("Generating polynomial: 10001000000100001");
n=code.length();
 copy=code;
 code+=zero;
 System.out.println("Modified poly: "+code);
 code=ob.divide(code);
 System.out.println("CheckSum: "+code.substring(n));
 copy=copy.substring(0,n)+code.substring(n);
 System.out.println("Final Codeword: "+copy);
 // System.out.print("\nEnter recived data: ");
 // rec=in.nextLine();
 // if(zero.equals(ob.divide(rec).substring(n)))
 // System.out.println("Correct bits recieved");
 // else
 // System.out.println("Recieved frame contains one or more
errors");
 System.out.print("Test Error detection 0(yes) 1(no)? : ");  int
```

```
choice = in.nextInt();
 if(choice == 0){
 System.out.print("Enter position on error: ");
 int errorPos = in.nextInt();
 if(copy.charAt(errorPos) == '1')
 copy = copy.substring(0,errorPos) + "0" + copy.substring(errorPos+1);
 else
 copy = copy.substring(0,errorPos) + "1" +
copy.substring(errorPos+1);
 System.out.println("Errorneous data: "+copy);
System.out.println("Error detected");  }
 else
 System.out.println("No Error detection");  }
 public String divide(String s){
 int i,j;
 char x;
 String div="10001000000100001";
 for(i=0;i<n;i++){
 x=s.charAt(i);
 for(j=0;j<17;j++){
 if(x=='1'){
 if(s.charAt(i+j)!=div.charAt(j))
 s=s.substring(0,i+j)+"1"+s.substring(i+j+1);  else
 s=s.substring(0,i+j)+"0"+s.substring(i+j+1);  }
 }
 }
 return s;
 }
}
```

OUTPUT:



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

```
import java.io.*;
public class Main
{
 static int graph[][];
 static int via[][];
 static int rt[][];
 static int v;
 static int e;

 public static void main(String args[]) throws IOException
 {
  BufferedReader br = new BufferedReader(new InputStreamReader(System.in));

  System.out.println("Please enter the number of Vertices: ");
  v = Integer.parseInt(br.readLine());

  System.out.println("Please enter the number of Edges: ");
  e = Integer.parseInt(br.readLine());

  graph = new int[v][v];
  via = new int[v][v];
```

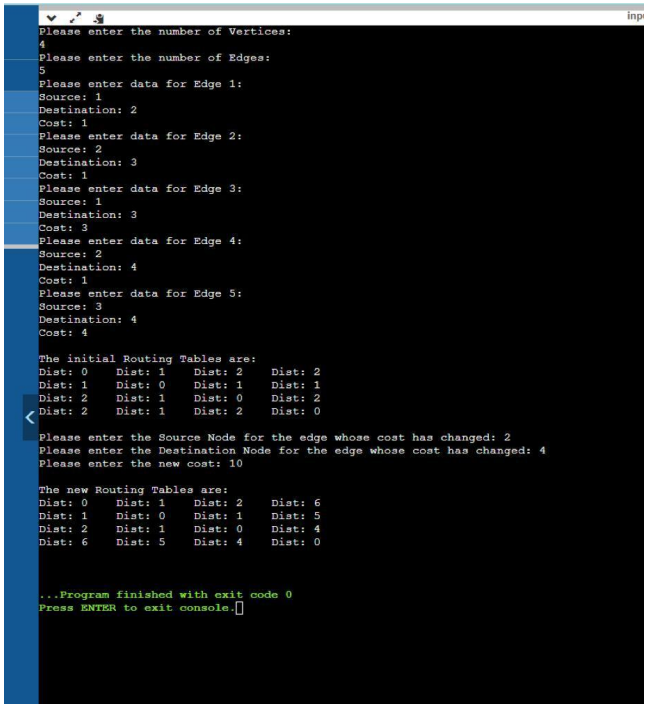
```
  rt = new int[v][v];
  for(int i = 0; i < v; i++)
   for(int j = 0; j < v; j++)
   {
    if(i == j)
     graph[i][j] = 0;
    else
     graph[i][j] = 9999;
   }

  for(int i = 0; i < e; i++)
  {
   System.out.println("Please enter data for Edge " + (i + 1) + ":");
   System.out.print("Source: ");
   int s = Integer.parseInt(br.readLine());
   s--;
   System.out.print("Destination: ");
   int d = Integer.parseInt(br.readLine());
   d--;
   System.out.print("Cost: ");
   int c = Integer.parseInt(br.readLine());
   graph[s][d] = c;
   graph[d][s] = c;
  }

  dvr_calc_disp("The initial Routing Tables are: ");

  System.out.print("Please enter the Source Node for the edge whose cost has
changed: ");
  int s = Integer.parseInt(br.readLine());
  s--;
  System.out.print("Please enter the Destination Node for the edge whose cost has
changed: ");
  int d = Integer.parseInt(br.readLine());
```

```
 d--;
 System.out.print("Please enter the new cost: ");
 int c = Integer.parseInt(br.readLine());
 graph[s][d] = c;
 graph[d][s] = c;

 dvr_calc_disp("The new Routing Tables are: ");
}

static void dvr_calc_disp(String message)
{
 System.out.println();
 init_tables();
 update_tables();
 System.out.println(message);
 print_tables();
 System.out.println();
}

static void update_table(int source)
{
 for(int i = 0; i < v; i++)
 {
  if(graph[source][i] != 9999)
  {
   int dist = graph[source][i];
   for(int j = 0; j < v; j++)
   {
    int inter_dist = rt[i][j];
    if(via[i][j] == source)
     inter_dist = 9999;
    if(dist + inter_dist < rt[source][j])
    {
     rt[source][j] = dist + inter_dist;
```

```
    via[source][j] = i;
   }
  }
 }
}
}

static void update_tables()
{
 int k = 0;
 for(int i = 0; i < 4*v; i++)
 {
  update_table(k);
  k++;
  if(k == v)
   k = 0;
 }
}

static void init_tables()
{
 for(int i = 0; i < v; i++)
 {
  for(int j = 0; j < v; j++)
  {
   if(i == j)
   {
    rt[i][j] = 0;
    via[i][j] = i;
   }
   else
   {
    rt[i][j] = 9999;
    via[i][j] = 100;
```

```
   }
  }
 }
}

static void print_tables()
{
 for(int i = 0; i < v; i++)
 {
  for(int j = 0; j < v; j++)
  {
   System.out.print("Dist: " + rt[i][j] + "    ");
  }
  System.out.println();
 }
}

}
```

OUTPUT:



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

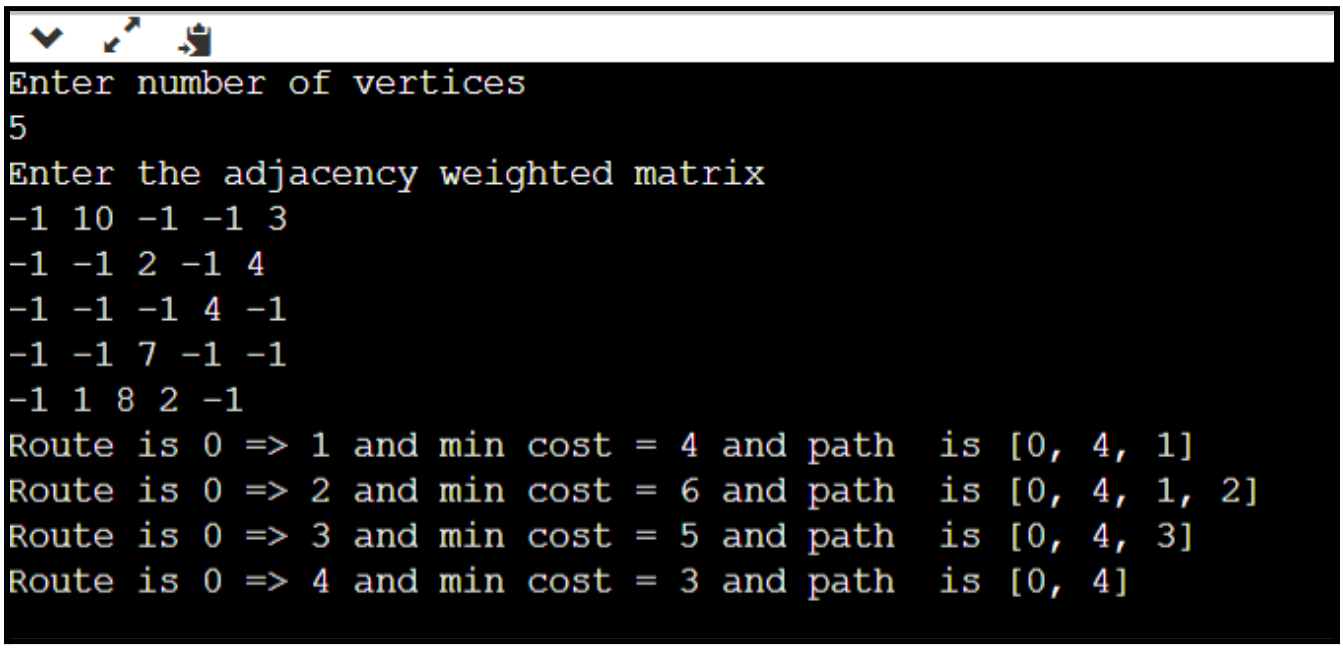
```
import java.util.*;
class Edge{
 int src, dest, w;
 public Edge(int src, int dest, int w){
 this.src = src;
 this.dest = dest;
 this.w = w;
 }
}

class Node {
 int vertex, w;
 public Node(int vertex, int w) {
 this.vertex = vertex;
 this.w = w;
 }
}


class Graph{
 List<List<Edge>> edgeList = null;
 Graph(List<Edge> edges, int N){
 edgeList = new ArrayList<>();
 for (int i = 0; i < N; i++) {
 edgeList.add(new ArrayList<>());
 }
 for (Edge edge: edges){
 edgeList.get(edge.src).add(edge);
 }
 }
}
```

```
class Main{
 private static void getPath(int[] prev, int i, List<Integer> route){  if
(i >= 0){
 getPath(prev, prev[i], route);
 route.add(i);
 }
 }

 public static void getShortestPath(Graph graph, int src, int N){
PriorityQueue<Node> minHeap;
 minHeap = new PriorityQueue<>(Comparator.comparingInt(node ->
node.w));
 minHeap.add(new Node(src, 0));
 List<Integer> dist = new ArrayList<>(Collections.nCopies(N,
Integer.MAX_VALUE));
 dist.set(src, 0);
 boolean[] done = new boolean[N];
 done[src] = true;
 int[] prev = new int[N];
 prev[src] = -1;
 List<Integer> route = new ArrayList<>();
 while (!minHeap.isEmpty()){
 Node node = minHeap.poll();
 int u = node.vertex;
 for (Edge edge: graph.edgeList.get(u)){
 int v = edge.dest;
 int w = edge.w;
 if (!done[v] && (dist.get(u) + w) < dist.get(v)){
 dist.set(v, dist.get(u) + w);
 prev[v] = u;
 minHeap.add(new Node(v, dist.get(v)));
 }
 }
```

```
done[u] = true;
}
for(int i = 1; i < N; ++i){
if (i != src && dist.get(i) != Integer.MAX_VALUE) {
getPath(prev, i, route);
System.out.printf("Route is %d => %d and min cost = %d and path  is
%s\n",
src, i, dist.get(i), route);
route.clear();
}
}
}

 public static void main(String[] args){
Scanner s = new Scanner(System.in);
List<Edge> edges = new ArrayList<>();
System.out.println("Enter number of vertices");
int n = s.nextInt();
System.out.println("Enter the adjacency weighted matrix");
int[][] mat = new int[n][n];
for(int i=0; i<n; i++){
for(int j=0; j<n; j++){
mat[i][j] = s.nextInt();
}
}

for(int i=0; i<n; i++){
for(int j=0; j<n; j++){
if(i == j) continue;
if(mat[i][j] != -1){
edges.add(new Edge(i, j, mat[i][j]));
}
}
}
```

```
Graph graph = new Graph(edges, n);
int src = 0;
getShortestPath(graph, src, n);
s.close();
}
}
```

OUTPUT:



```
Enter number of vertices
5
Enter the adjacency weighted matrix
-1 10 -1 -1 3
-1 -1 2 -1 4
-1 -1 -1 4 -1
-1 -1 7 -1 -1
-1 1 8 2 -1
Route is 0 => 1 and min cost = 4 and path  is [0, 4, 1]
Route is 0 => 2 and min cost = 6 and path  is [0, 4, 1, 2]
Route is 0 => 3 and min cost = 5 and path  is [0, 4, 3]
Route is 0 => 4 and min cost = 3 and path  is [0, 4]
```

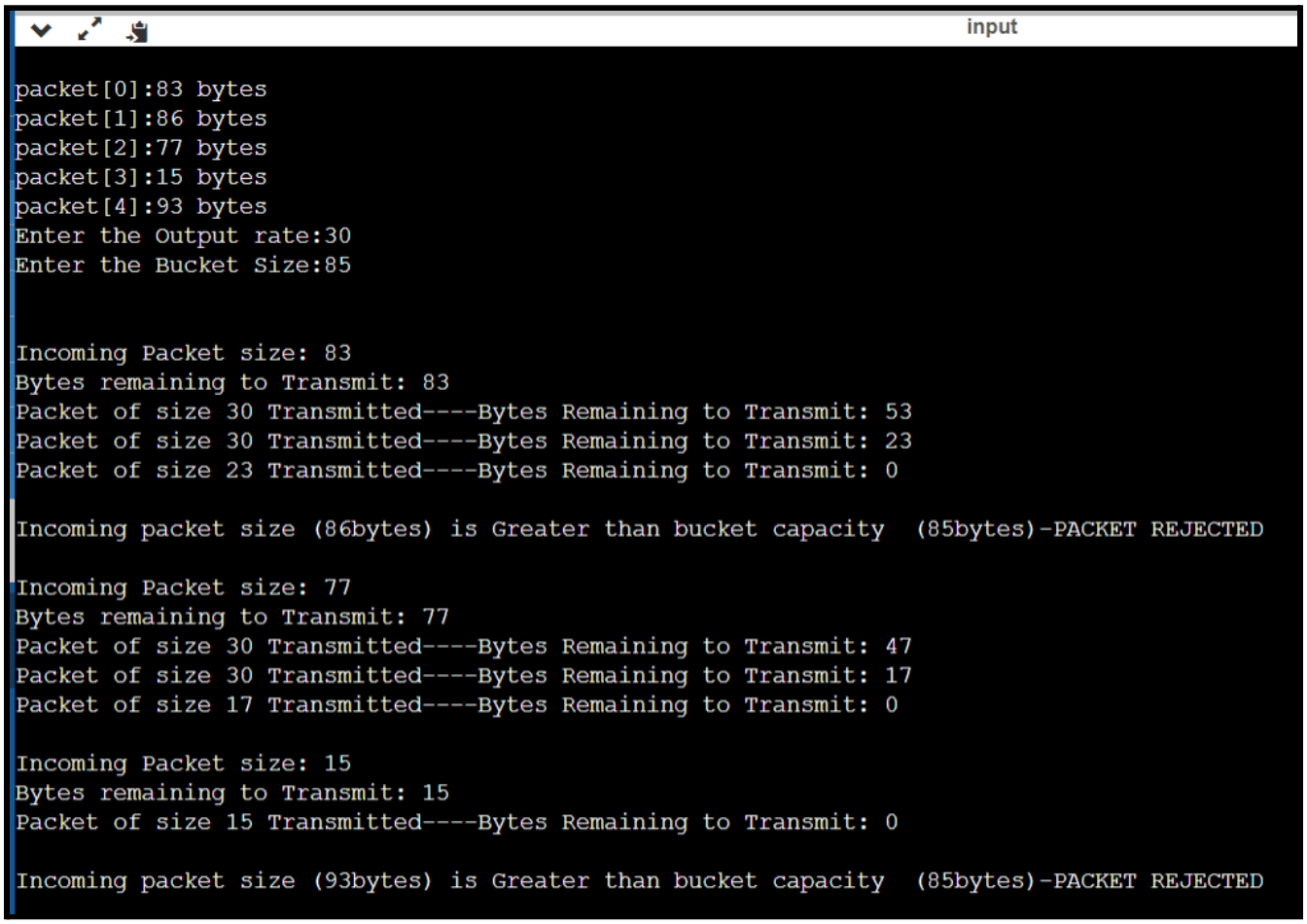
4. Write a program for congestion control using Leaky Bucket algorithm.

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#define NOF_PACKETS 5
/*
int rand (int a)
{
int rn = (random() % 10) % a;
return rn == 0 ? 1 : rn;
}
*/
/*
#include &lt;stdlib.h&gt;
```

```
long int random(void);

3
The random() function uses a nonlinear additive feedback random number generator employing a default ta-
ble of size 31 long integers to return successive pseudo-random numbers in the
range from 0 to RAND_MAX.
The period of this random number generator is very large, approximately 16 *
((2^31) - 1).
*/
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(&quot;\nTime left for transmission: %d units&quot;, p_time);
//for(clk = 10; clk &lt;= 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:



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

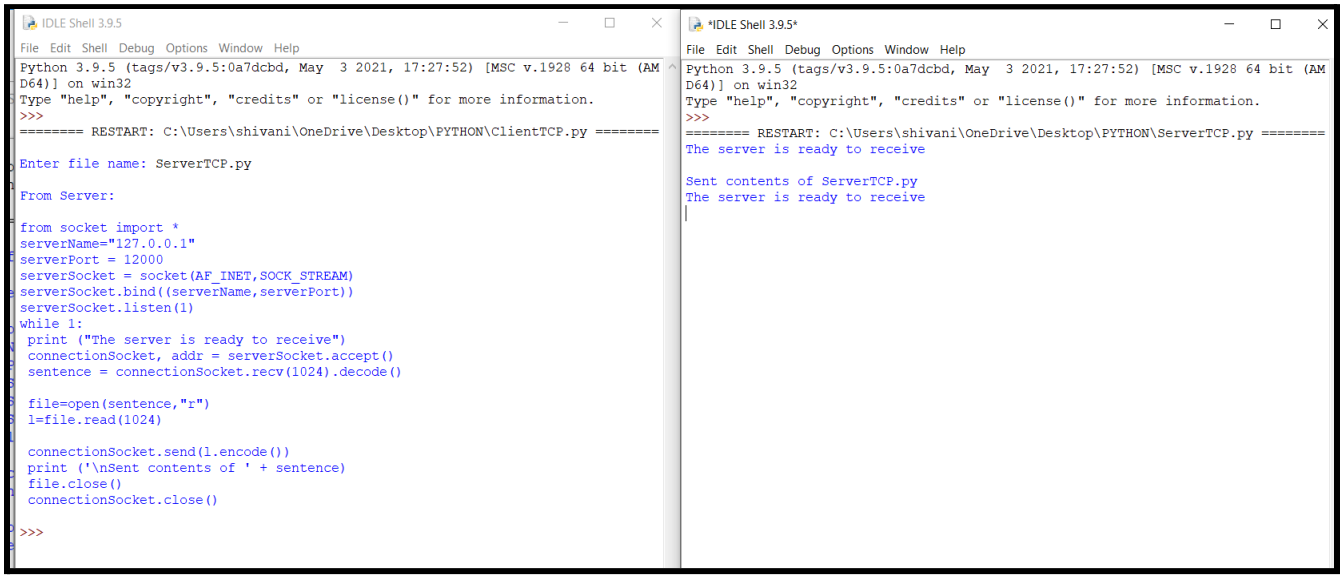
ClientTCP.py

```
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()
```

ServerTCP.py

```
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()
```

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.

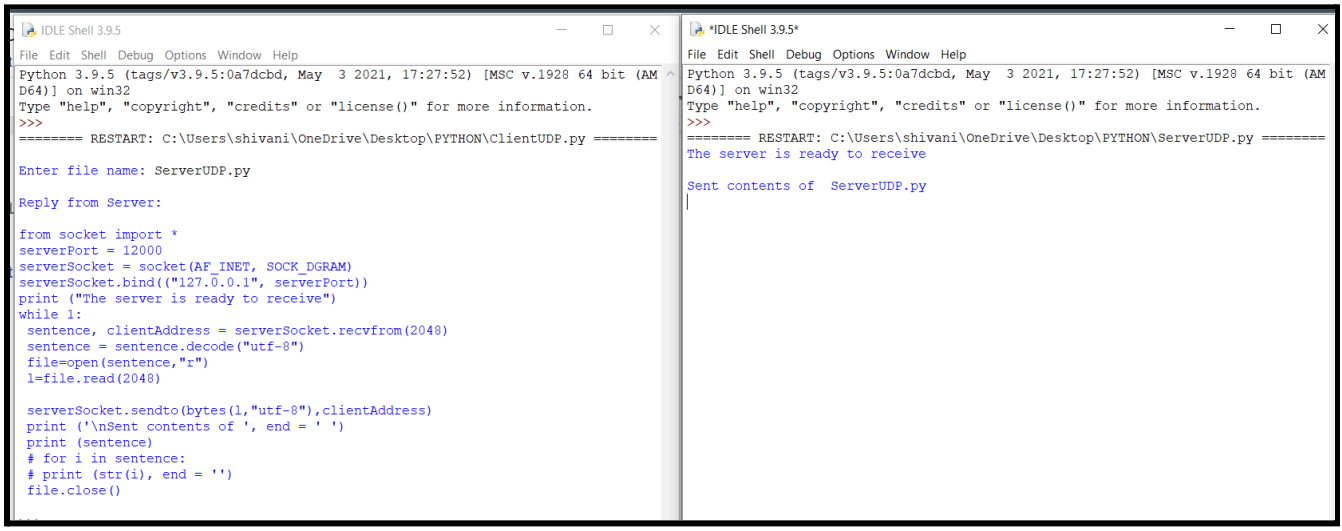
ClientUDP.py

```
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()
```

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)
 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()
```

OUTPUT:


IDLE Shell 3.9.5
File Edit Shell Debug Options Window Help
Python 3.9.5 (tags/v3.9.5:0a7dcbd, May 3 2021, 17:27:52) [MSC v.1928 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
======== RESTART: C:\Users\shivani\OneDrive\Desktop\PYTHON\ClientUDP.py ========
Enter file name: ServerUDP.py
Reply from Server:
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()
IDLE Shell 3.9.5
File Edit Shell Debug Options Window Help
Python 3.9.5 (tags/v3.9.5:0a7dcbd, May 3 2021, 17:27:52) [MSC v.1928 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
======== RESTART: C:\Users\shivani\OneDrive\Desktop\PYTHON\ServerUDP.py ========
The server is ready to receive
Sent contents of ServerUDP.py