Computer Networks Cycle 2 Programs and Output

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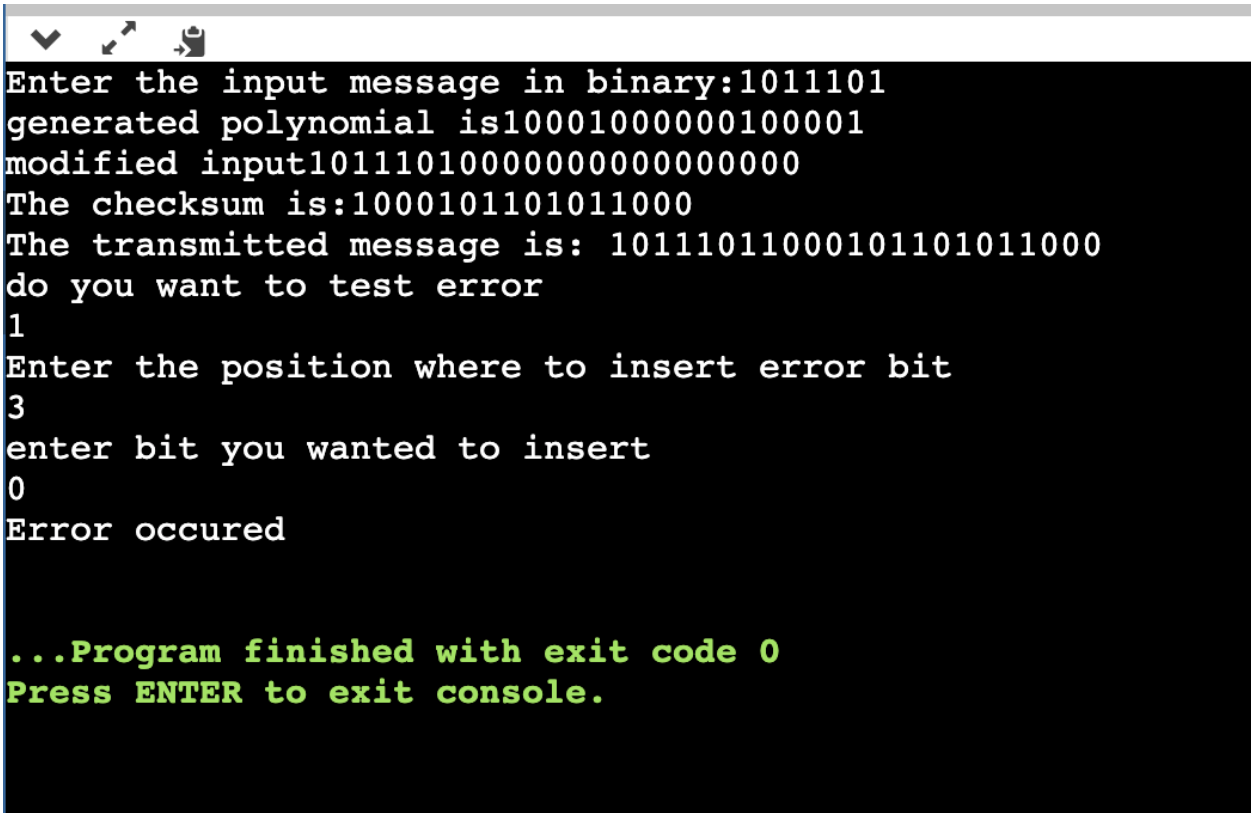
1.Write a Program for error detecting code using CRC-CCITT(16-bits).

```
#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;

}
```



```
Enter the input message in binary:1011101
generated polynomial is10001000000100001
modified input10111010000000000000000
The checksum is:1000101101011000
The transmitted message is: 10111011000101101011000
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


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

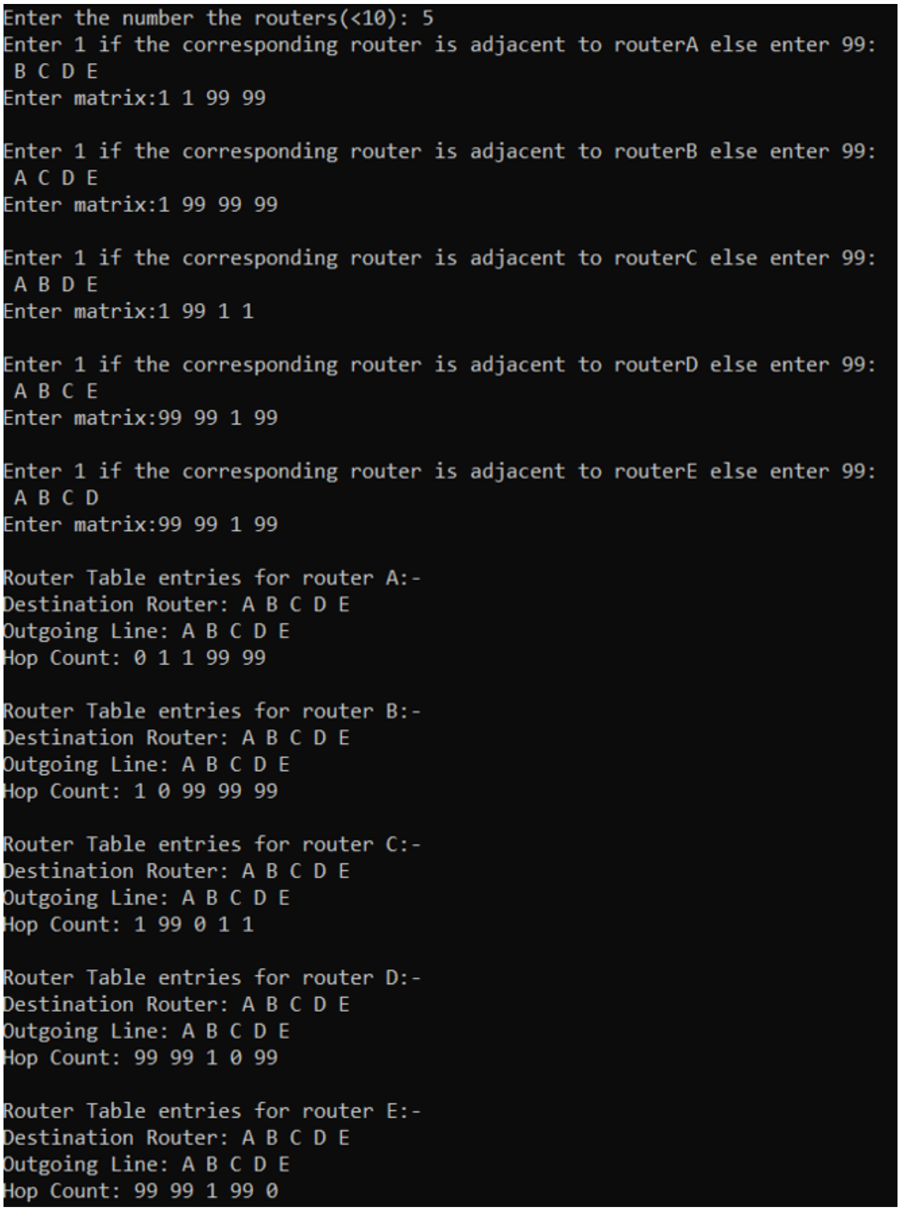
2. Write a program for distance vector algorithm to find suitable path for transmission.

```
#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;
```

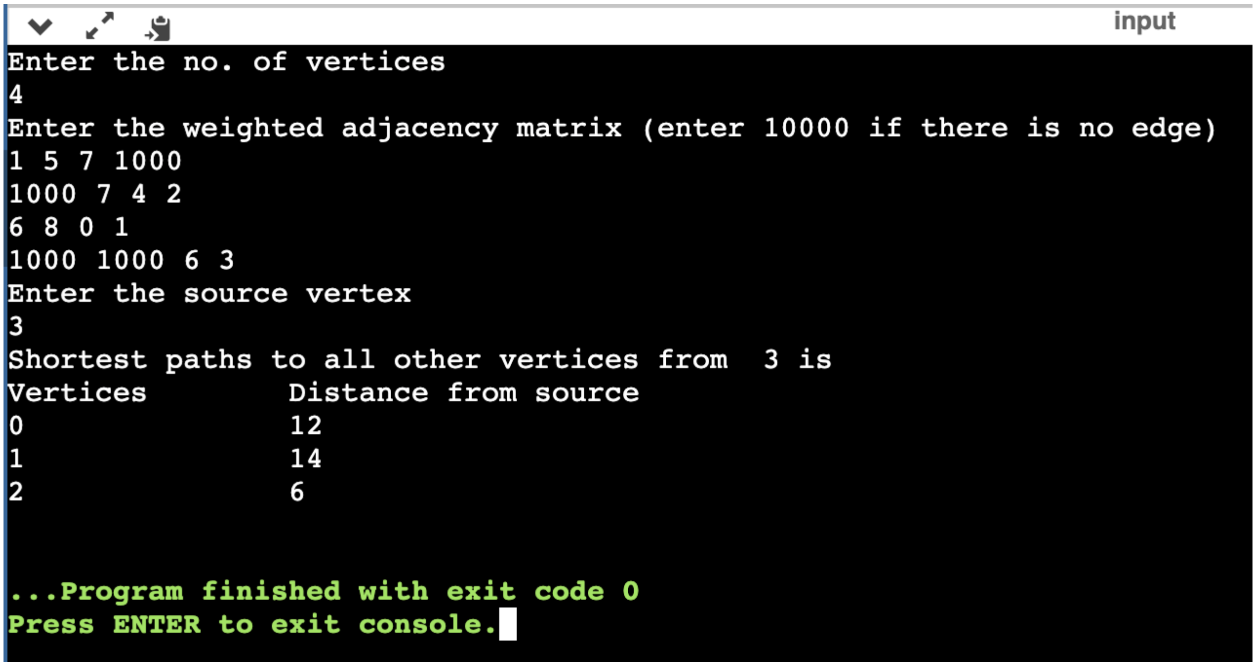
```
for(int i=0;i<n;i++) r[i].input(i);
build_table();
for(int i=0;i<n;i++) {
cout<<"Router Table entries for router "<<(char)('A'+i)<<":-";
r[i].display();
cout<<endl<<endl;
}
}
```



```
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.

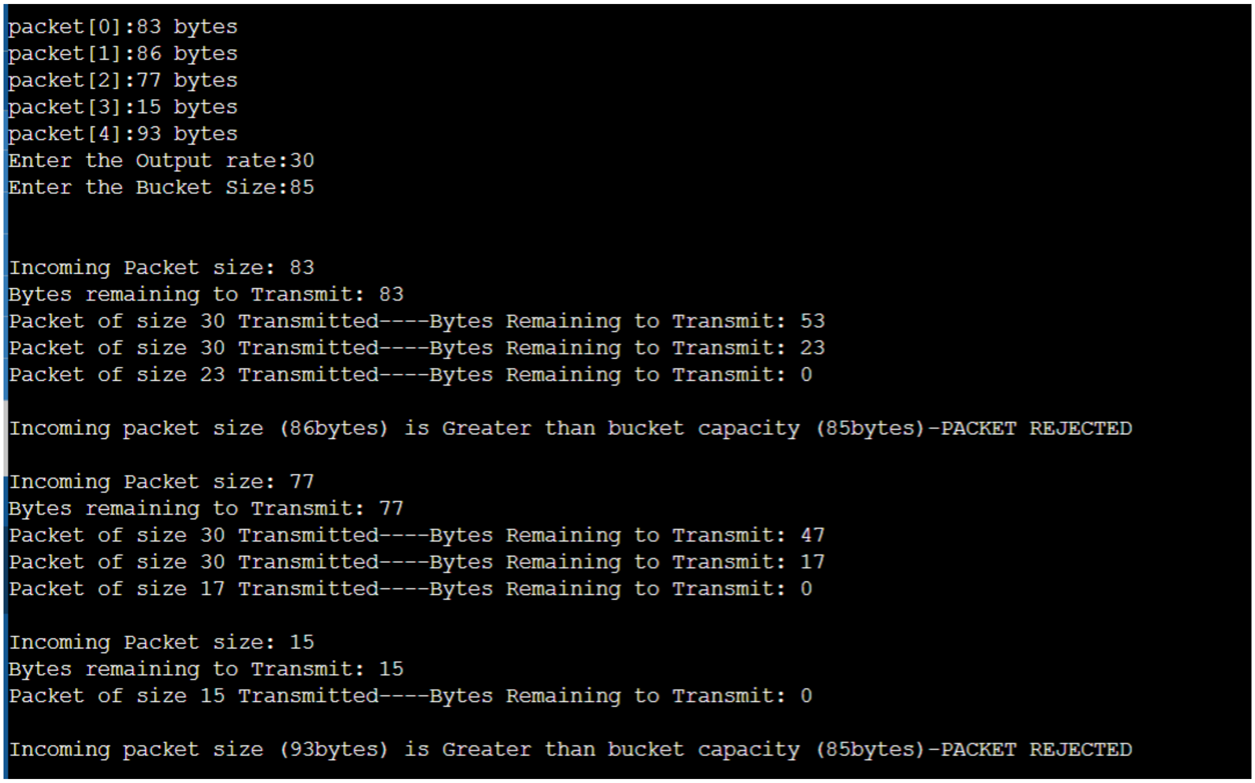
```
#include<bits/stdc++.h>
using namespace std;
#define V 3
int minDistance(int dist[], bool sptSet[]){
int min = 9999, min_index;
for (int v = 0; v < V; v++)
if (sptSet[v] == false && dist[v] <= min)
min = dist[v], min_index = v;
return min_index;
}
void printPath(int parent[], int j){
if (parent[j] == - 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;
}
```



```
Enter the no. of vertices
4
Enter the weighted adjacency matrix (enter 10000 if there is no edge)
1 5 7 1000
1000 7 4 2
6 8 0 1
1000 1000 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


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

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

```
#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;
}
```



```
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
```

**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.**

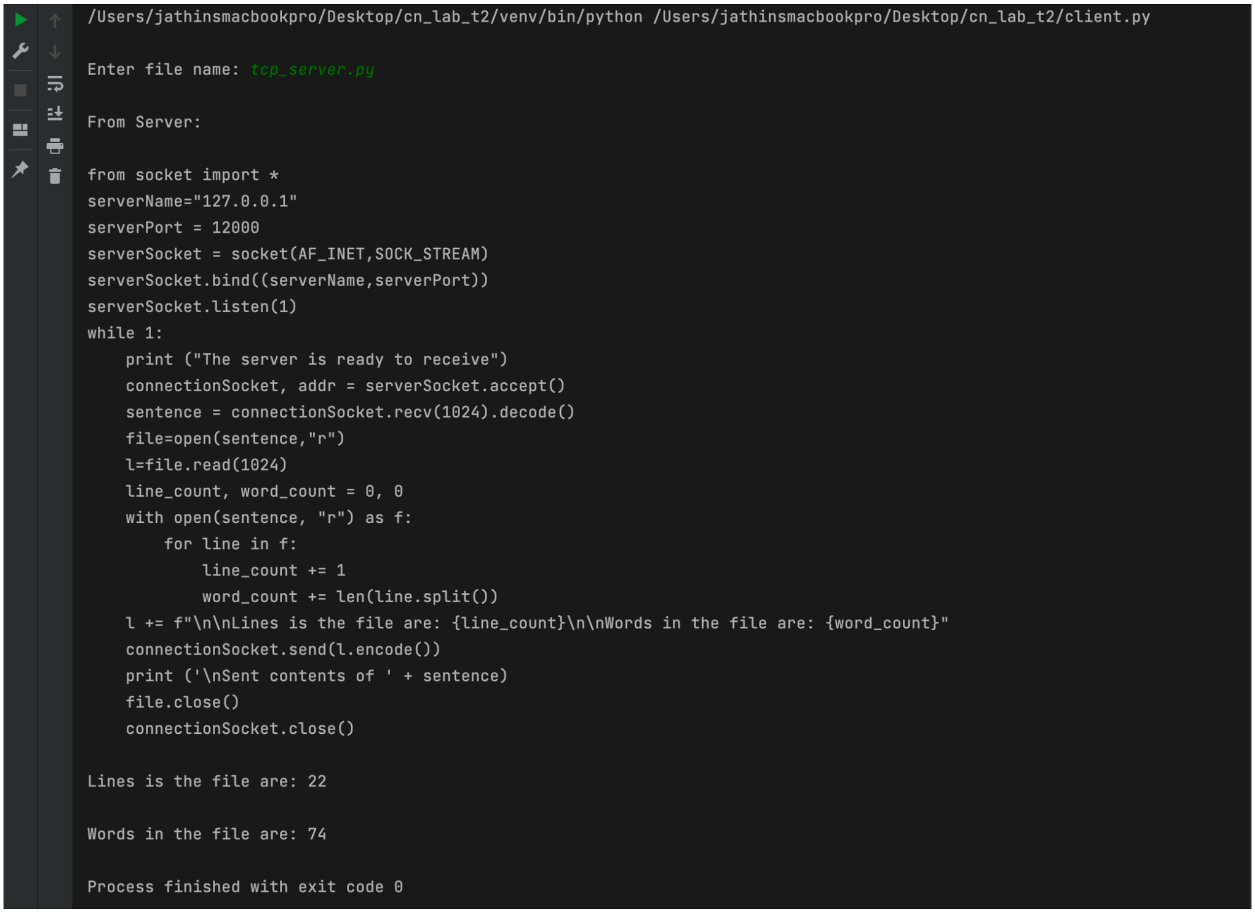
Server.py

```
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)
    line_count, word_count = 0, 0
    with open(sentence, "r") as f:
        for line in f:
            line_count += 1
            word_count += len(line.split())
    l += f"\n\nLines is the file are: {line_count}\n\nWords in the file are:
{word_count}"
    connectionSocket.send(l.encode())
    print ('\nSent contents of ' + sentence)
    file.close()
    connectionSocket.close()
```

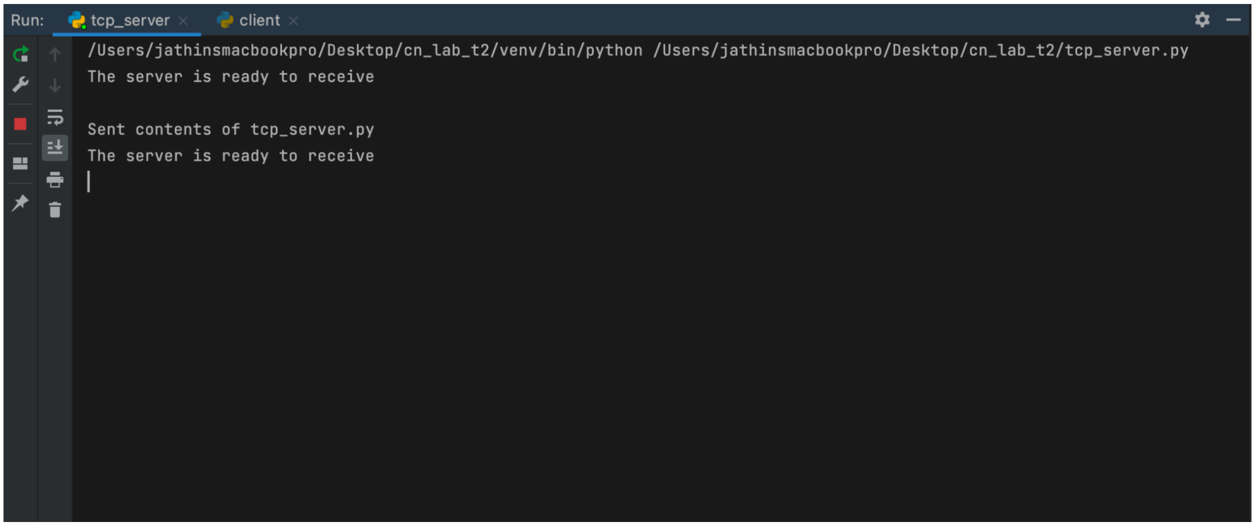
Client.py

```
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()
```



```
/Users/jathinsmacbookpro/Desktop/cn_lab_t2/venv/bin/python /Users/jathinsmacbookpro/Desktop/cn_lab_t2/client.py

Enter file name: tcp_server.py

From Server:

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)
    line_count, word_count = 0, 0
    with open(sentence, "r") as f:
        for line in f:
            line_count += 1
            word_count += len(line.split())
    l += f"\n\nLines is the file are: {line_count}\n\nWords in the file are: {word_count}"
    connectionSocket.send(l.encode())
    print ('\nSent contents of ' + sentence)
    file.close()
    connectionSocket.close()

Lines is the file are: 22

Words in the file are: 74

Process finished with exit code 0
```

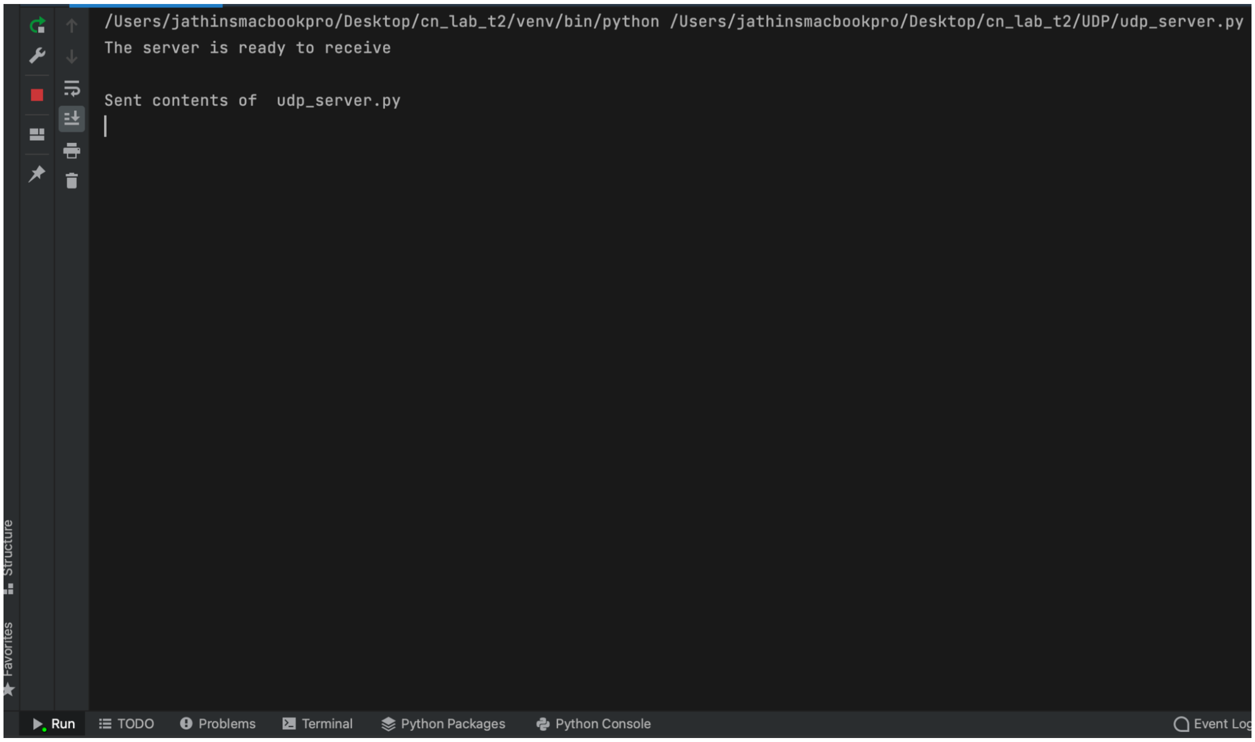


```
/Users/jathinsmacbookpro/Desktop/cn_lab_t2/venv/bin/python /Users/jathinsmacbookpro/Desktop/cn_lab_t2/tcp_server.py
The server is ready to receive

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

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.

ServerUDP.ipynb

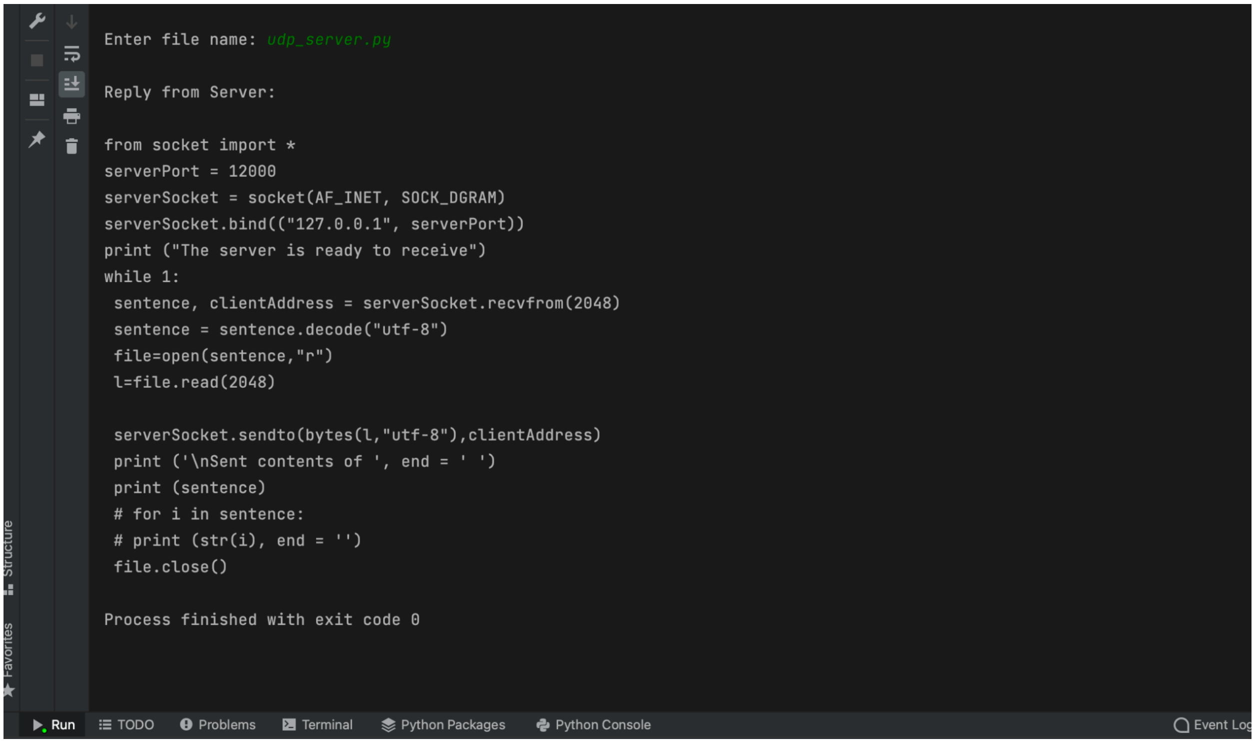
```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
 sentence, clientAddress = serverSocket.recvfrom(2048)
 sentence = sentence.decode("utf-8")
 file=open(sentence,"r")
 l=file.read(2048)

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



```
/Users/jathinsmacbookpro/Desktop/cn_lab_t2/venv/bin/python /Users/jathinsmacbookpro/Desktop/cn_lab_t2/UDP/udp_server.py
The server is ready to receive

Sent contents of  udp_server.py
```

ClientUDP.ipynb

```
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()
```



```
Enter file name: udp_server.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()

Process finished with exit code 0
```