COMPUTER NETWORKS

LAB RECORD

LAB TEST 2

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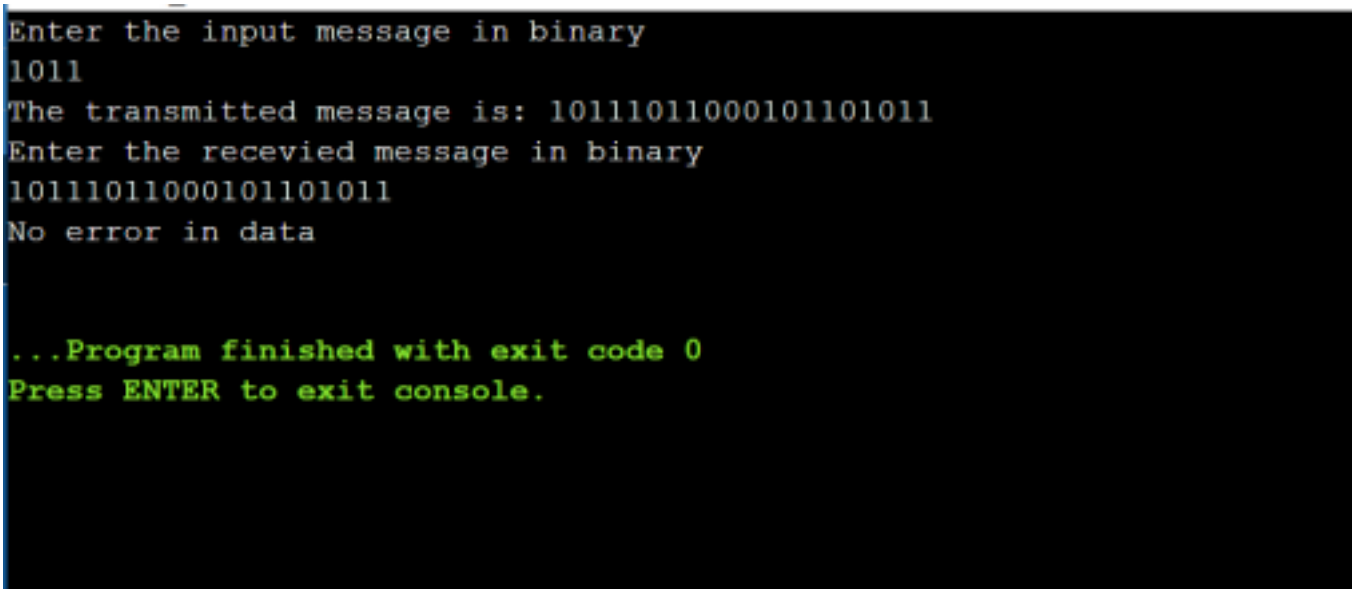
CYCLE 2

PROGRAM 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");
   }
   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";

   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 received 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;
}
```



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

```
#include<stdio.h>
struct node
{
        unsigned dist[20];
        unsigned from[20];
}rt[10];
int main()
{
        int dmat[20][20];
        int n,i,j,k,count=0;
        printf("\nEnter the number of nodes : ");
        scanf("%d",&n);
        printf("\nEnter the cost matrix :\n");
        for(i=0;i<n;i++)
                for(j=0;j<n;j++){
                        scanf("%d",&dmat[i][j]);
                        dmat[i][i]=0;
                        rt[i].dist[j]=dmat[i][j];
                        rt[i].from[j]=j;
                }
        do{
                count=0;
                for(i=0;i<n;i++)
                   for(j=0;j<n;j++)
                      for(k=0;k<n;k++)
                         if(rt[i].dist[j]>dmat[i][k]+rt[k].dist[j]){
                                rt[i].dist[j]=rt[i].dist[k]+rt[k].dist[j];
                                rt[i].from[j]=k;
                                count++;
                         }
        }while(count!=0);
        for(i=0;i<n;i++)
```

```
        {
                printf("\n\nState value for router %d is \n",i+1);
                for(j=0;j<n;j++){
                        printf(" \t\nnode %d via %d Distance : %d",j+1,rt[i].from[j]+1,rt[i].dist[j]);
                }
        }
}
```

```
Enter the number of nodes : 4

Enter the cost matrix :
0 5 99 99
5 0 3 99
99 3 0 1
99 99 1 0


State value for router 1 is

node 1 via 1 Distance : 0
node 2 via 2 Distance : 5
node 3 via 2 Distance : 8
node 4 via 2 Distance : 9

State value for router 2 is

node 1 via 1 Distance : 5
node 2 via 2 Distance : 0
node 3 via 3 Distance : 3
node 4 via 3 Distance : 4

State value for router 3 is

node 1 via 2 Distance : 8
node 2 via 2 Distance : 3
node 3 via 3 Distance : 0
node 4 via 4 Distance : 1

State value for router 4 is

node 1 via 3 Distance : 9
node 2 via 3 Distance : 4
node 3 via 3 Distance : 1
node 4 via 4 Distance : 0

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

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

```
#include<bits/stdc++.h>
#include <limits.h>
#include <stdio.h>
using namespace std;
#define V 9
int minDistance(int dist[], bool sptSet[])
{
   int min = INT_MAX, 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 printSolution(int dist[])
{
   printf("Vertex \t\t Distance from Source\n");
   for (int i = 0; i < V; i++)
      printf("%d \t\t %d\n", i, dist[i]);
}
void dijkstra(int graph[V][V], int src)
{
   int dist[V];
   bool sptSet[V];
   for (int i = 0; i < V; i++)
      dist[i] = INT_MAX, 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] != INT_MAX && dist[u] + graph[u][v] <
            dist[v]) dist[v] = dist[u] + graph[u][v];
   }
   printSolution(dist);
}
int main()
{
   int graph[V][V] ;
   cout<<"Enter the graph "<<endl;
   for(int i = 0; i<V; i++)
      for(int j = 0; j<V; j++)
         cin>>graph[i][j];
   dijkstra(graph, 0);
   return 0;
}
```

```
Enter the graph
0 4 0 0 0 0 0 8 0
4 0 8 0 0 0 0 11 0
0 8 0 7 0 4 0 0 2
0 0 7 0 9 14 0 0 0
0 0 0 9 0 10 0 0 0
0 0 4 14 10 0 2 0 0
0 0 0 0 0 2 0 1 6
8 11 0 0 0 0 1 0 7
0 0 2 0 0 0 6 7 0
Vertex              Distance from Source
0                   0
1                   4
2                   12
3                   19
4                   21
5                   11
6                   9
7                   8
8                   14


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

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

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

#define NOF_PACKETS 10

int rando(int a)
{
   int rn = (random() % 10) % a;
   return rn == 0 ? 1 : rn;
}

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] = rando(6) * 10;
   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)
            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 = rando(4) * 10;
         printf("\nTime left for transmission: %d units", p_time);
         for(clk = 10; clk <= p_time; clk += 10)
         {
            sleep(1);
            if(p_sz_rm)
            {
               if(p_sz_rm <= o_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("\nTime left for transmission: %d units", p_time-clk);
               printf("\nNo packets to transmit!!");
            }
         }
      }
   }
}
```

```
packet[0]:30 bytes
packet[1]:10 bytes
packet[2]:10 bytes
packet[3]:50 bytes
packet[4]:30 bytes
packet[5]:50 bytes
packet[6]:10 bytes
packet[7]:20 bytes
packet[8]:30 bytes
packet[9]:10 bytes
Enter the Output rate:10
Enter the Bucket Size:25


Incoming packet size (30bytes) is Greater than bucket capacity (25bytes)-PACKET REJECTED

Incoming Packet size: 10
Bytes remaining to Transmit: 10
Time left for transmission: 20 units
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 0
Time left for transmission: 0 units
No packets to transmit!!

Incoming Packet size: 10
Bytes remaining to Transmit: 10
Time left for transmission: 30 units
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 0
Time left for transmission: 10 units
No packets to transmit!!
Time left for transmission: 0 units
No packets to transmit!!
```

```
Incoming packet size (50bytes) is Greater than bucket capacity (25bytes)-PACKET REJECTED

Incoming packet size (30bytes) is Greater than bucket capacity (25bytes)-PACKET REJECTED

Incoming packet size (50bytes) is Greater than bucket capacity (25bytes)-PACKET REJECTED

Incoming Packet size: 10
Bytes remaining to Transmit: 10
Time left for transmission: 10 units
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 0

Incoming Packet size: 20
Bytes remaining to Transmit: 20
Time left for transmission: 10 units
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 10

Incoming packet size (30bytes) is Greater than bucket capacity (25bytes)-PACKET REJECTED

Incoming Packet size: 10
Bytes remaining to Transmit: 20
Time left for transmission: 30 units
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 10
Packet of size 10 Transmitted----Bytes Remaining to Transmit: 0
Time left for transmission: 0 units
No packets to transmit!!

...Program finished with exit code 0
```

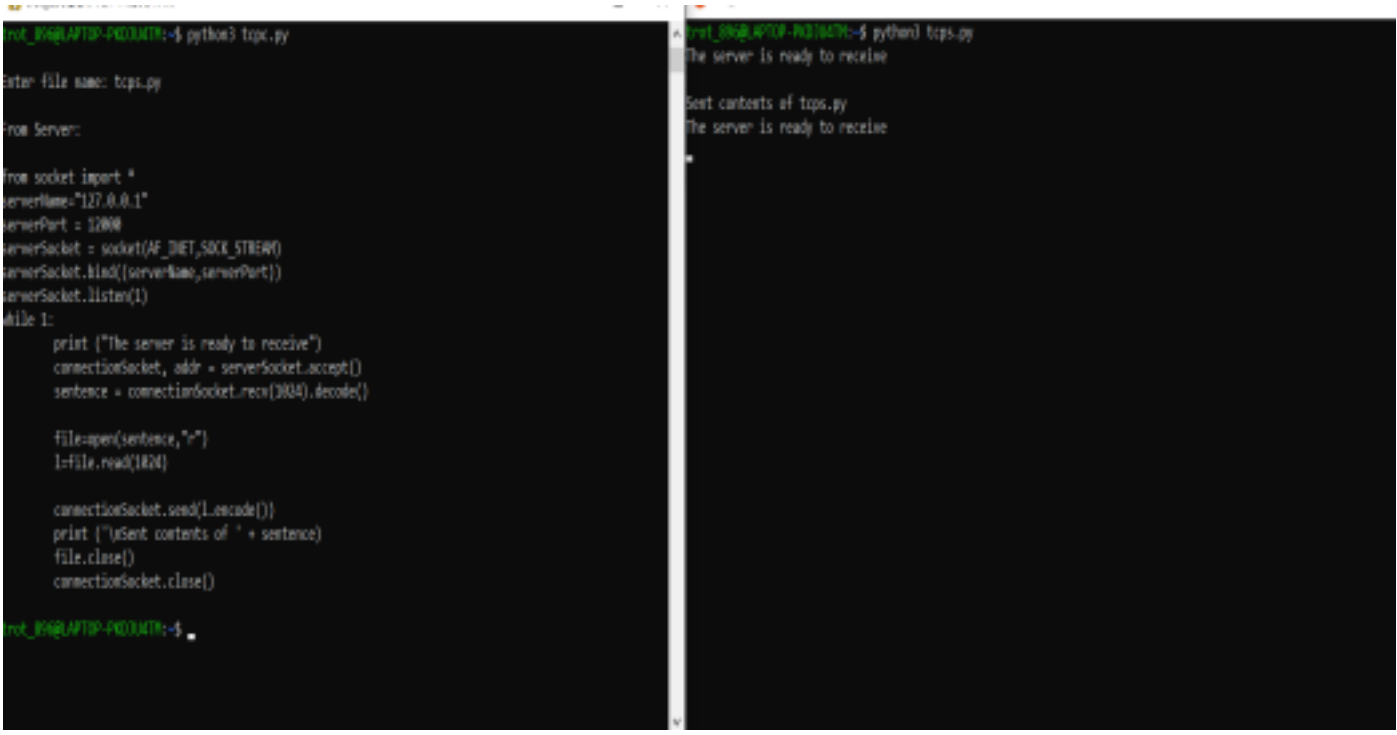
PROGRAM 5 : USING TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

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()
```



PROGRAM 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"))
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)
file.close()
```