CYCLE 2 EXPRIMENTS :

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;
}
```

OUTPUT :

Output 1

```
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
```

Output 2

```
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
0

Enter the recevied message in binary
10111011000101101011001
Error in data transmission has occurred
```

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;
 }
}
```

OUTPUT :

```
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<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 :

```
Enter the no. of vertices
4
Enter the weighted adjacency matrix (enter 10000 if there is no ed
ge)
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
```

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 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
```

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()
```

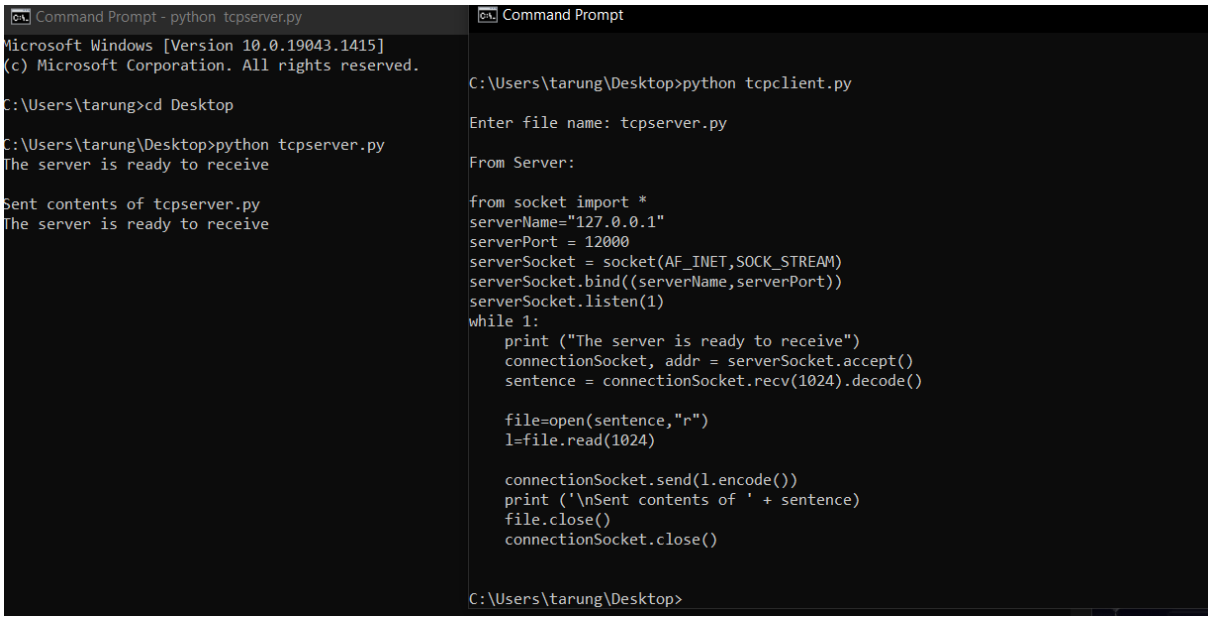
ServerTCP.py

```
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()
```

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()
```

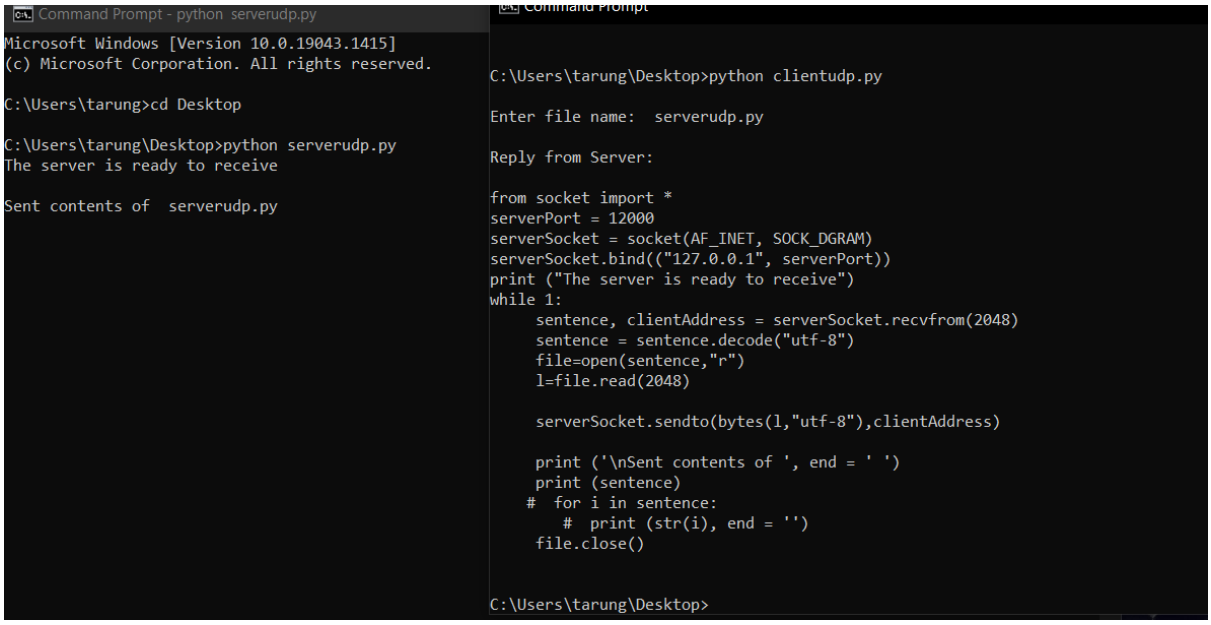
ServerUDP.py

```
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 :


Command Prompt - python serverudp.py
Microsoft Windows [Version 10.0.19043.1415]
(c) Microsoft Corporation. All rights reserved.
C:\Users\tarung>cd Desktop
C:\Users\tarung\Desktop>python serverudp.py
The server is ready to receive
Sent contents of serverudp.py
C:\Users\tarung\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()
C:\Users\tarung\Desktop>