CN LAB RECORD

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

CODE:

```
#include<stdio.h>
char m[50],g[50],r[50],q[50],temp[50];
void caltrans(int);
void crc(int);
void calram();
void shiftl();
int main()
{
int n,i=0;
char ch,flag=0;
printf("Enter the frame bits:");
while((ch=getc(stdin))!='\n')
m[i++]=ch;
n=i;
for(i=0;i<16;i++)
m[n++]='0';
m[n]='\0';
printf("Message after appending 16 zeros:%s",m);
for(i=0;i<=16;i++)
g[i]='0';
g[0]=g[4]=g[11]=g[16]='1';g[17]='\0';
printf("\ngenerator:%s\n",g);
crc(n);
printf("\n\nquotient:%s",q);
caltrans(n);
printf("\ntransmitted frame:%s",m);
printf("\nEnter transmitted frame:");
scanf("\n%s",m);
printf("CRC checking\n");
crc(n);
printf("\n\nlast remainder:%s",r);
for(i=0;i<16;i++)
if(r[i]!='0')
flag=1;
else
continue;
if(flag==1)
printf("Error during transmission");
else
printf("\n\nReceived frame is correct");
}
void crc(int n)
{
int i,j;
```

```
for(i=0;i<n;i++)
temp[i]=m[i];
for(i=0;i<16;i++)
r[i]=m[i];
printf("\nintermediate remainder\n");
for(i=0;i<n-16;i++)
{
if(r[0]=='1')
{
q[i]='1';
calram();
}
else
{
q[i]='0';
shiftl();
}
r[16]=m[17+i];
r[17]='\0';
printf("\nremainder %d:%s",i+1,r);
for(j=0;j<=17;j++)
temp[j]=r[j];
}
q[n-16]='\0';
}
void calram()
{
int i,j;
for(i=1;i<=16;i++)
r[i-1]=((int)temp[i]-48)^((int)g[i]-48)+48;
}
void shiftl()
{
int i;
for(i=1;i<=16;i++)
r[i-1]=r[i];
}
void caltrans(int n)
{
int i,k=0;
for(i=n-16;i<n;i++)
m[i]=((int)m[i]-48)^((int)r[k++]-48)+48;
m[i]='\0';
}
```

OUTPUT:

```
Enter the frame bits:110110
Message after appending 16 zeros:1101100000000000000000
generator:10001000000100001

intermediate remainder

remainder 1:10100000001000010
remainder 2:01010000011000110
remainder 3:10100000110001100
remainder 4:01010001101011010
remainder 5:10100011010110100
remainder 6:0101011010010101

quotient:110101
transmitted frame:11011001010110100101010
Enter transmitted frame:11011001010110100101010
CRC checking

intermediate remainder

remainder 1:10100010100101011
remainder 2:01010101000010100
remainder 3:10101010000101001
remainder 4:01000100000010000
remainder 5:10001000000100001
remainder 6:0000000000000000

last remainder:0000000000000000

Received frame is correct
```

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

CODE:

```
#include <iostream>
using namespace std;

struct node {
      int dist[20];
      int from[20];
} route[10];

int main()
{
      int dm[20][20], no;

      cout << "Enter no of nodes." << endl;
      cin >> no;
      cout << "Enter the distance matrix:" << endl;
      for (int i = 0; i < no; i++) {
            for (int j = 0; j < no; j++) {
                  cin >> dm[i][j];
                  /*  Set distance from i to i as 0 */
                  dm[i][i] = 0;
                  route[i].dist[j] = dm[i][j];
                  route[i].from[j] = j;
            }
      }

      int flag;
      do {
            flag = 0;
            for (int i = 0; i < no; i++) {
                  for (int j = 0; j < no; j++) {
                        for (int k = 0; k < no; k++) {
                              if ((route[i].dist[j]) >
(route[i].dist[k] + route[k].dist[j])) {
                                    route[i].dist[j] = route[i].dist[k]
+ route[k].dist[j];
                                    route[i].from[j] = k;
                                    flag = 1;
                              }
                        }
                  }
            }
      } while (flag);

      for (int i = 0; i < no; i++) {
            cout << "Router info for router: " << i + 1 << endl;
            cout << "Dest\tNext Hop\tDist" << endl;
            for (int j = 0; j < no; j++)
                  printf("%d\t%d\t\t%d\n", j+1, route[i].from[j]+1,
route[i].dist[j]);
```

```
        }
        return 0;
}
```

OUTPUT:

```
Enter no of nodes.
4
Enter the distance matrix:
10 2 5 6
7 2 1 9
45 2 8 1
5 4 3 8
Router info for router: 1
Dest    Next Hop        Dist
1       1               0
2       2               2
3       2               3
4       3               4
Router info for router: 2
Dest    Next Hop        Dist
1       1               7
2       2               0
3       3               1
4       3               2
Router info for router: 3
Dest    Next Hop        Dist
1       4               6
2       2               2
3       3               0
4       4               1
Router info for router: 4
Dest    Next Hop        Dist
1       1               5
2       2               4
3       3               3
4       4               0
```

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

CODE:

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

#define V 4

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;
}
```

OUTPUT:

```
Please Enter The Graph (!!! Use 99 for infinity):
0 4 5 99
45 0 2 6
5 8 0 99
4 12 6 0
Enter the source vertex:
0
Vertex   Distance       Path

0 -> 1          4               0 1
0 -> 2          5               0 2
0 -> 3          10              0 1 3
```

LAB 4: Write a program for congestion control using Leaky bucket algorithm.

CODE:

```
#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 <stdlib.h>

     long int random(void);
```

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.

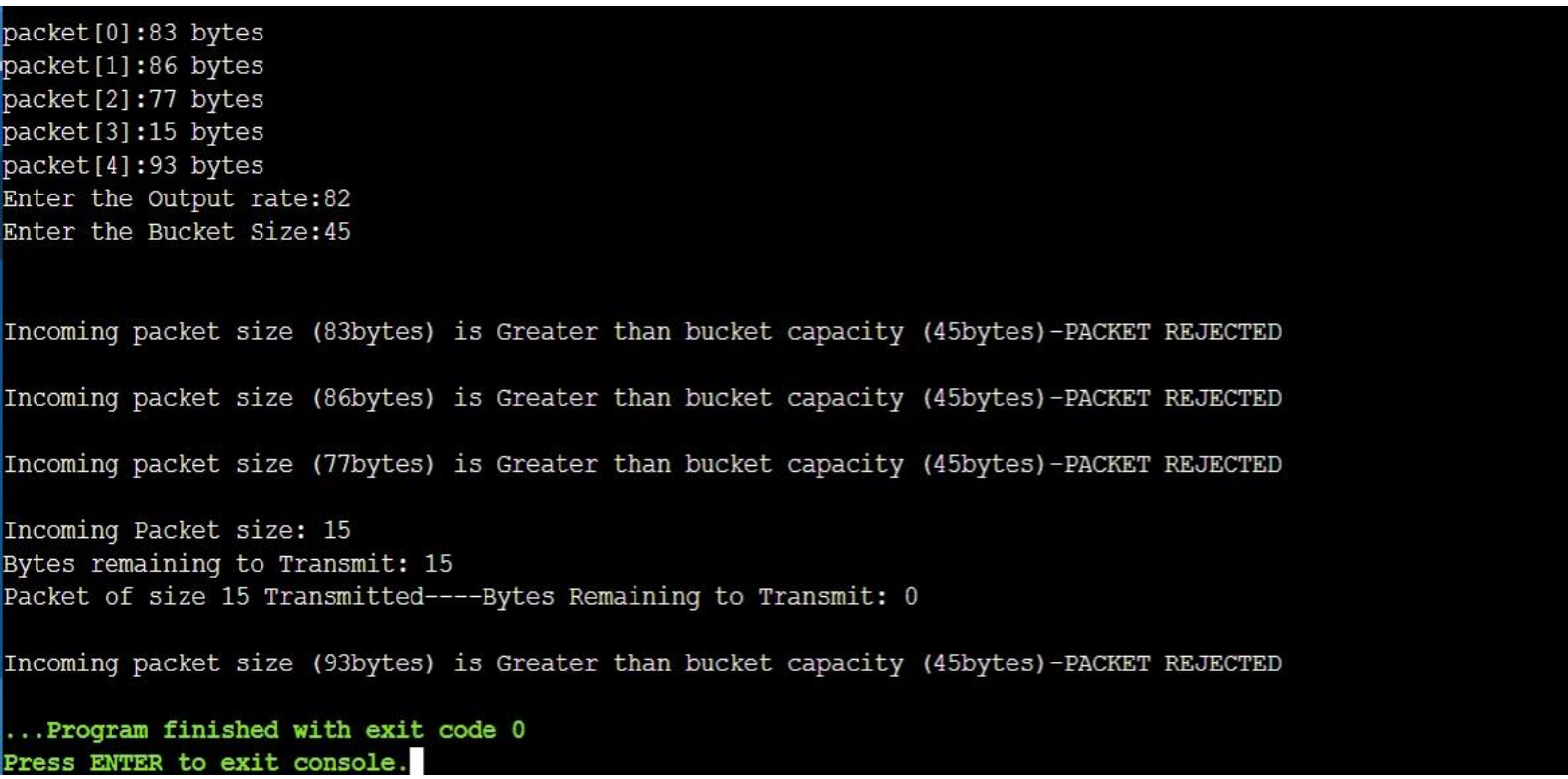
The period of this random number generator is very large, approximately 16 * ((2^31) - 1).

```
*/
```

```
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("\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:82
Enter the Bucket Size:45
Incoming packet size (83bytes) is Greater than bucket capacity (45bytes)-PACKET REJECTED
Incoming packet size (86bytes) is Greater than bucket capacity (45bytes)-PACKET REJECTED
Incoming packet size (77bytes) is Greater than bucket capacity (45bytes)-PACKET REJECTED
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 (45bytes)-PACKET REJECTED
...Program finished with exit code 0
Press ENTER to exit console.

LAB 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.

CODE:

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()
```

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()
```

OUTPUT:

```
Enter file name: CRC.c

From Server:

#include<stdio.h>
char m[50],g[50],r[50],q[50],temp[50];
void caltrans(int);
void crc(int);
void calram();
void shiftl();
int main()
{
int n,i=0;
char ch,flag=0;
printf("Enter the frame bits:");
while((ch=getc(stdin))!='\n')
m[i++]=ch;
n=i;
for(i=0;i<16;i++)
m[n++]='0';
m[n]='\0';
printf("Message after appending 16 zeros:%s",m);
for(i=0;i<=16;i++)
g[i]='0';
g[0]=g[4]=g[11]=g[16]='1';g[17]='\0';
printf("\ngenerator:%s\n",g);
crc(n);
printf("\n\nquotient:%s",q);
caltrans(n);
printf("\ntransmitted frame:%s",m);
```

```
The server is ready to receive

Sent contents of CRC.c
The server is ready to receive
```

S

LAB 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.

CODE:

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()
```

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()
```

OUTPUT

```
Enter file name:  CRC.c

Reply from Server:

#include<stdio.h>
char m[50],g[50],r[50],q[50],temp[50];
void caltrans(int);
void crc(int);
void calram();
void shiftl();
int main()
{
int n,i=0;
char ch,flag=0;
printf("Enter the frame bits:");
while((ch=getc(stdin))!='\n')
m[i++]=ch;
n=i;
for(i=0;i<16;i++)
m[n++]='0';
m[n]='\0';
printf("Message after appending 16 zeros:%s",m);
for(i=0;i<=16;i++)
g[i]='0';
g[0]=g[4]=g[11]=g[16]='1';g[17]='\0';
printf("\ngenerator:%s\n",g);
crc(n);
printf("\n\nquotient:%s",q);
caltrans(n);
printf("\ntransmitted frame:%s",m);
```

```
Sent contents of  CRC.c
```