COMPUTER NETWORKS LAB CYCLE 2 PROGRAMS

NAME: MANJULA

USN: 1BM20CS408

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 :

```
Enter the input message in binary:1011101
generated polynomial is10001000000100001
modified input10111010000000000000000
The checksum is:1000101101011000
The transmitted message is: 101110110001011010110000
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
```

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.

```
/*implement Dijkstra's algorithm to compute the shortest path through a graph.*/

#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.

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()
```

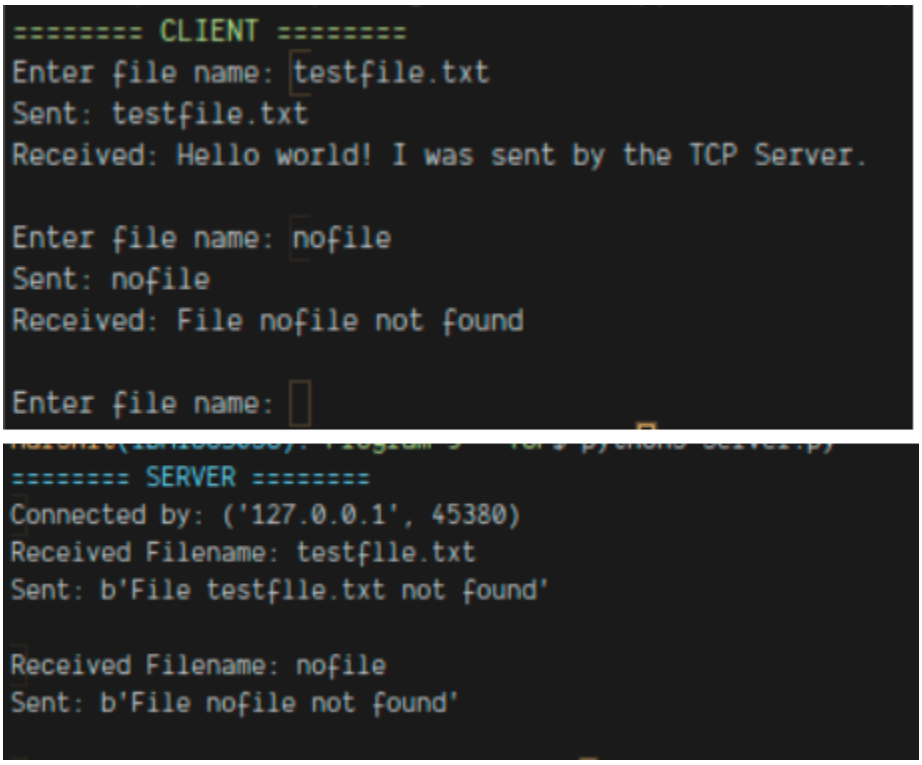
server.py

```
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)

 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.

client.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()
```

server.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 :

```
======== CLIENT ========
Enter file to request from server: testfile.txt
Sent: testfile.txt
Received: Hello world! I was sent by the UDP Server.

Enter file to request from server: nofile
Sent: nofile
Received: File nofile not found

Enter file to request from server:
```

```
======== SERVER ========
Received Filename: testfile.txt From: ('127.0.0.1', 36898)
Sent: b'Hello world! I was sent by the UDP Server.' To: ('127.0.0.1', 36898)

Received Filename: nofile From: ('127.0.0.1', 36898)
Sent: b'File nofile not found' To: ('127.0.0.1', 36898)
```