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1BM19CS135

CYCLE 2
COMPUTER NETWORKS LAB

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

```
def xor1(a, b):
    x = ""
    # print(len(a),len(b))
    for i in range(1, len(a)):
        if a[i] == b[i]:
            x += "0"
        else:
            x += "1"
    return x

def modulo2(divident, divisor):
    divlen = len(divisor)
    temp = divident[0:divlen]
    # print(temp)
    while(divlen < len(divident)):
        if temp[0] == "1":
            temp = xor1(temp, divisor)+divident[divlen]
        else:
            temp = temp[1:divlen]+divident[divlen]
        # print(temp)
        divlen += 1
    # print(temp)
    if temp[0] == "1":
        temp = xor1(temp, divisor)
        # return "0"+temp
    # print(len(temp),)
    if len(temp) < len(divisor):
        return "0"+temp
    return temp


def encode(data, key):
    append = data+"0"*(len(key))
    # print(code)
    rem = modulo2(append, key)
    print("remaindar="+rem)
    code = data+rem
    print("code="+code)

    # Checking the logic:

    rem = modulo2(code, key)
    print("Remaindar we get when we do not have error="+rem)
    code = code.replace("011", "101")
    rem = modulo2(code, key)
    print("Remaindar we get when we have error="+rem)
```

```
def polytobin(string):
    keys = []
    key = ""
    for i in string:
        if i == '+':
            keys.append(int(key[1:]))
            key = ""
            continue
        key += i
    if key != "":
        keys.append(0)
    bina = ""
    j = 0
    print(keys)
    for i in range(keys[0], -1, -1):
        if i == (keys[j]):
            bina += "1"
            j += 1
        else:
            bina += "0"
    print(bina)
    return bina

string = input("Enter the key polynomial:\n")
key = polytobin(string)
string = input("Enter the data polynomial:\n")
data = polytobin(string)
print(key, data)
encode(data, key)
```

OUTPUT:

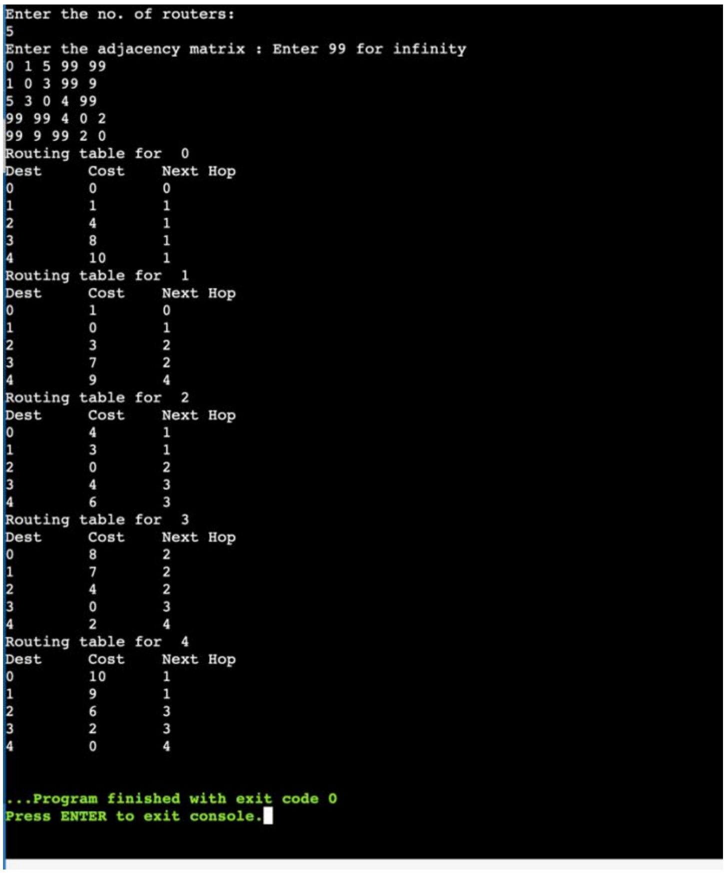
```
Enter the key polynomial:
x16+x12+x4+1
[16, 12, 4, 0]
10001000000010001
Enter the data polynomial:
x15+x12+x11+x8+x7+x4+x3+1
[15, 12, 11, 8, 7, 4, 3, 0]
1001100110011001
10001000000010001 1001100110011001
remaindar=00001001000010010
code=100110011001100100001001000010010
Remaindar we get when we do not have error=0000000000000000
Remaindar we get when we have error=00110011001100000


...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.

```
class Graph:

    def __init__(self, vertices):
        self.V = vertices
        self.graph = []


    def add_edge(self, s, d, w):
        self.graph.append([s, d, w])
```

```
    def print_solution(self, dist, src, next_hop):
        print("Routing table for ", src)
        print("Dest \t Cost \t Next Hop")
        for i in range(self.V):
            print("{0} \t {1} \t {2}".format(i, dist[i], next_hop[i]))

    def bellman_ford(self, src):

        dist = [99] * self.V
        dist[src] = 0
        next_hop = {src: src}
         for _ in range(self.V - 1):
            for s, d, w in self.graph:
                if dist[s] != 99 and dist[s] + w < dist[d]:
                    dist[d] = dist[s] + w
                    if s == src:
                        next_hop[d] =d
                    elif s in next_hop:
                        next_hop[d] = next_hop[s]

        for s, d, w in self.graph:
            if dist[s] != 99 and dist[s] + w < dist[d]:
                print("Graph contains negative weight cycle")
                return

        self.print_solution(dist, src, next_hop)


def main():
    matrix = []
    print("Enter the no. of routers:")
    n = int(input())
    print("Enter the adjacency matrix : Enter 99 for infinity")
    for i in range(0,n):
        a = list(map(int, input().split(" ")))
        matrix.append(a)

    g = Graph(n)
    for i in range(0,n):
        for j in range(0,n):
            g.add_edge(i,j,matrix[i][j])

    for k in range(0, n):
        g.bellman_ford(k)

main()
```

OUTPUT:



```
Enter the no. of routers:
5
Enter the adjacency matrix : Enter 99 for infinity
0 1 5 99 99
1 0 3 99 9
5 3 0 4 99
99 99 4 0 2
99 9 99 2 0
Routing table for  0
Dest     Cost    Next Hop
0        0       0
1        1       1
2        4       1
3        8       1
4        10      1
Routing table for  1
Dest     Cost    Next Hop
0        1       0
1        0       1
2        3       2
3        7       2
4        9       4
Routing table for  2
Dest     Cost    Next Hop
0        4       1
1        3       1
2        0       2
3        4       3
4        6       3
Routing table for  3
Dest     Cost    Next Hop
0        8       2
1        7       2
2        4       2
3        0       3
4        2       4
Routing table for  4
Dest     Cost    Next Hop
0        10      1
1        9       1
2        6       3
3        2       3
4        0       4


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

3. Implement Dijkstra’s algorithm to compute the shortest path for a given topology.

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

#define V 5

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 "<<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<<"Enter the graph (Enter 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: "<<endl;
    int src;
    cin>>src;
```

```
    dijkstra(graph, src);
    cout<<endl;
    return 0;
}
```

OUTPUT:

```
Enter the graph (Enter 99 for infinity):
0 1 5 99 99
1 0 3 99 9
5 3 0 4 99
99 99 4 0 2
99 9 99 2 0
Enter the source:
0
Vertex   Distance        Path

0 -> 1   1               0 1
0 -> 2   4               0 1 2
0 -> 3   8               0 1 2 3
0 -> 4   10              0 1 4


...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;
```

}

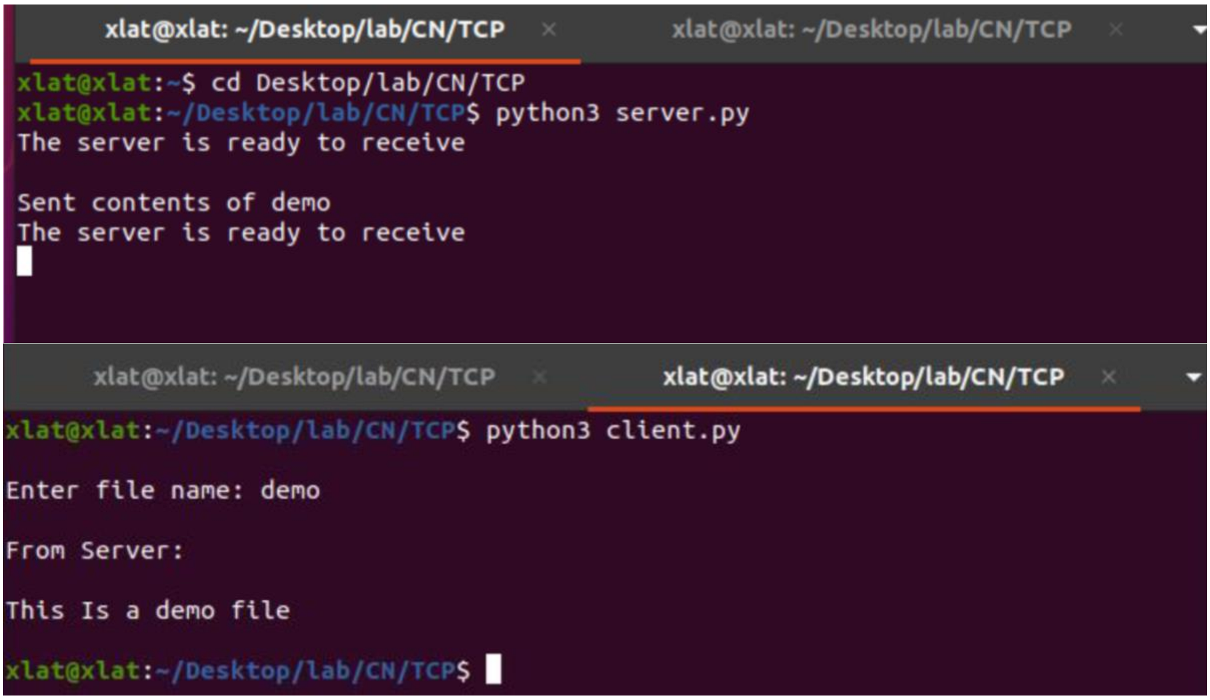
OUTPUT:

```
Enter output rate : 100

Packet no 1      Packet size = 186
                 100 bytes outputted.
                 Last 86 bytes sent
                 Bucket output successful
Packet no 2      Packet size = 215
                 100 bytes outputted.
                 100 bytes outputted.
                 Last 15 bytes sent
                 Bucket output successful
Packet no 3      Packet size = 535
                 Bucket overflow
Packet no 4      Packet size = 492
                 100 bytes outputted.
                 100 bytes outputted.
                 100 bytes outputted.
                 100 bytes outputted.
                 Last 92 bytes sent
                 Bucket output successful
Packet no 5      Packet size = 521
                 Bucket overflow


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

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("Enter file name")
clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print ('From Server:', 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)
print ("The server is ready to receive")
while 1:
connectionSocket, addr = serverSocket.accept()
sentence = connectionSocket.recv(1024).decode()
file=open(sentence,"r")
l=file.read(1024)
connectionSocket.send(l.encode())
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("Enter file name")
clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))
filecontents,serverAddress = clientSocket.recvfrom(2048)
print ('From Server:', filecontents)
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)
file=open(sentence,"r")
 l=file.read(2048)
serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
print("sent back to client",l)
file.close()
```

OUTPUT:

```
xlat@xlat: ~/Desktop/lab/CN/UDP        xlat@xlat: ~/Desktop/lab/CN/UDP
xlat@xlat:~/Desktop/lab/CN/UDP$ python3 server.py
The server is ready to receive
sent back to client This Is a demo file

```

```
xlat@xlat: ~/Desktop/lab/CN/UDP        xlat@xlat: ~/Desktop/lab/CN/UDP
xlat@xlat:~/Desktop/lab/CN/UDP$ python3 client.py
Enter file namedemo
From Server: b'This Is a demo file \n'
xlat@xlat:~/Desktop/lab/CN/UDP$
```