Laboratory Manual

For

COMPUTER AND COMMUNICATION NETWORK

(IT-407)

B.Tech (IT)

SEM IV

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Sample Experiment

1 AIM: To transfer a character from one computer to another.

2 TOOLS/APPARATUS: *Turbo C*, RS-232 cable.

3 STANDARD PROCEDURES:

3.1 Analyzing the Problem:

- Out of the 4 available commands: outport, inport, outportb and inportb which should be used is to be decided depending upon the requirement that a word is to be transmitted or a byte.

  As the data is to be transmitted within two machines, we need to create one .c or .cpp file at the transmitter side and another file should be creates at the machine that will receive the data. So, accordingly we will name the file as "Transmitter" and "Receiver" respectively.

  The source code will have to be written on both the receiver and transmitter side.

  Whenever the transmitter is ready to transmit the data as well as receiver is also ready to receive the data, the physical connection is to be established using the RS-232 cable and the code will have to be run on both the transmitter as well as receiver side.

3.2 Designing the Solution:

Create one file "transmitter" on one machine and one file named "receiver" on another machine.

The common procedure to be followed on both the transmitter and receiver side is:

Set the D-lab bit and other bits as per the requirement as described in the LCR format.

Set the baud rate in the specified registers.

Reset the D-Lab bit after setting the baud rate in the specific registers.

The LCR format is set in the 3FB register and the baud rate is set in 3F8 and 3F9 registers respectively.

Compile the source code on both transmitter and receiver side.

When the compilation is done successfully, run the code from the transmitter machine and when the data starts transmitting, run the code on the receiver side for receiving the data.

3.3 Implementing the Solution

3.3.1 Writing Source Code at Transmitter side:

```
#include<iostream.h>
#include<dos.h>
#include<io.h>
```

```
#include<string.h>
#include<conio.h>
#include<stdio.h>
#include<fstream.h>
void main()
{
clrscr();

int choice;
cout<<"enter the choice\n";
cout<<"1: character transfer\n";
cout<<"2: string transfer\n";
cout<<"3: file transfer";

cin>>choice;*/
switch(choice)
{
        case 1:



             void c_transfer();
             break;
        case 2:
                void s_transfer();
                break;
        case 3:
                void f_transfer();
                break;
        default:
                cout<<"Invalid choice";
}
void c_transfer()
{
char ch;
outport(0x3FB,0x8f);
outport(0x3f8,0x00);
outport(0x3f9,0x24);
outport(0x3f9,0x0f);
cout<<"the character recieved
is"; cin>>ch;
outport(0x3fb,ch);
cout<<"data has been trasmitted";
getch();
}
```

```
void s_transfer()
{

char s[10];
cout<<"enter the string to be transmitted";
for(i=0;i<10;i++)
{
cin<<s[i];
}
for(i=0;i<10;i++)
{
outport(0x3FB,0x8f);
outport(0x3f8,0x00);
outport(0x3f9,0x24);
outport(0x3f9,0x0f);
outport(0x3f8,s[i]);
}
cout<<"data has been trasmitted";
}
void f_transfer()
{
FILE *f1;
char ch;
f1=fopen("c:\test.txt","w");

while( (ch=getc(f1)) !=EOF)
{
 ch=getc(f1);
 cout<< ch;
 outport(0x3f8,ch);
}
fclose(f1);
ch='0';
outport(0x3f8,ch); cout<<"file
is transmitted \n";
}
   }
```

3.3.2 Writing Source Code at Receiver side:

```
#include<iostream.h>
#include<dos.h>
#include<io.h>
#include<string.h>
#include<conio.h>
#include<stdio.h>
```

```
#include<fstream.h>
void main()
{
clrscr();
int choice;
cout<<"enter the choice\n";
cout<<"1: character transfer\n";
cout<<"2: string transfer\n";
cout<<"3: file transfer";

cin>>choice;
switch(choice)
{
        case 1:
             void c_transfer();
             break;
        case 2:
                void s_transfer();
                break;
        case 3:
                void f_transfer();
                break;
        default:
                cout<<"Invalid choice";
}
void c_transfer()
{
char ch;
outport(0x3FB,0x8f);
outport(0x3f8,0x00);
outport(0x3f9,0x24);
outport(0x3f9,0x0f);
ch=inport(0x3f8);
cout<<"the character recieved
is"<<ch; getch();
}
void s_transfer()
{
char s[10];
for(i=0;i<10;i++)
{
outport(0x3FB,0x8f);
outport(0x3f8,0x00);
outport(0x3f9,0x24);
outport(0x3f9,0x0f);
```

```
s[i]=inport(0x3f8);
}
cout<<"the string recieved is"<<s;
}
void f_transfer()
{
FILE *f1;
char ch='1','0';
outport(0x3FB,0x8f);
outport(0x3f8,0x00);
outport(0x3f9,0x24);
outport(0x3f9,0x0f);
f1=fopen("c:\test.txt","w");
cout<<"recieving
Data<<end; while(c!='0')
{
        ch=inport(0x3f8);
        if(a==c)
         {
         break;
         }
        cout<<'l';
        cout<<ch;
        fclose(f1);
cout<<"Data
received"; getch();
}
```

3.3.3 Compilation /Running and Debugging the Solution

Go to Compile Menu and Press the Compile for the Compilation of the code.

If Successful Compilation is done then Run the Code Using ctrl + F9 key.

Before Compilation, following steps are to be followed:

Step 1: Create a folder in either E or F drive with your Id Number or Name Followed by RollNo.

Step 2: Start the TC (Turbo C) from Desktop Icon or Go To Directory D:/TC/BIN/ and run tc.exe . An Editor will be start.

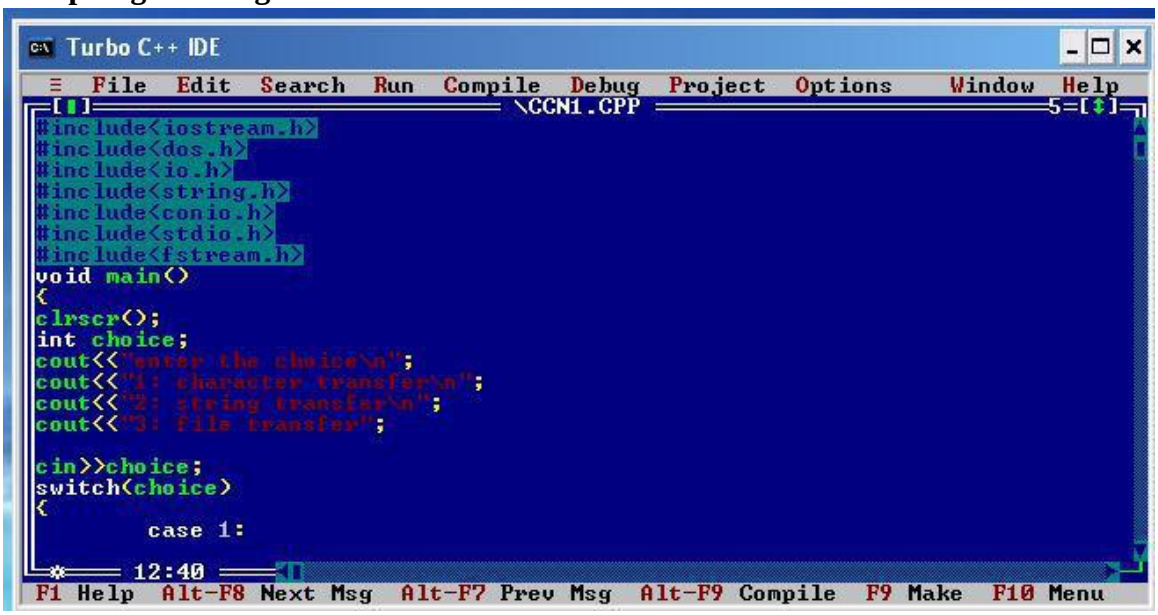
Step 3: Click on File Menu --> New. New (.cpp) file will be created. Again Click on File -> Save. A dialog box will open. Write the path to your directory

e.g. E:\CCN_Program \FileName.CPP and Press OK.

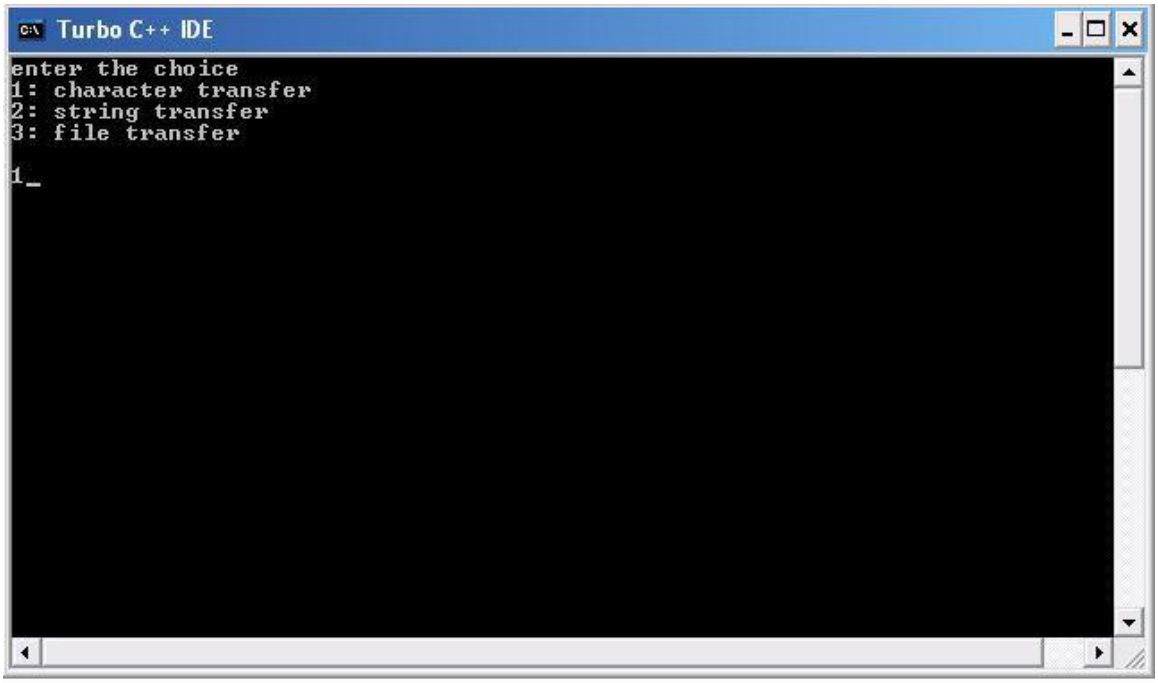
Now your cpp program will be saved in your directory.

Step 4: Go To Option->Directories Check That Include Directory is set As D:\TC\Include and Library Directory is set To D:\TC\LIB

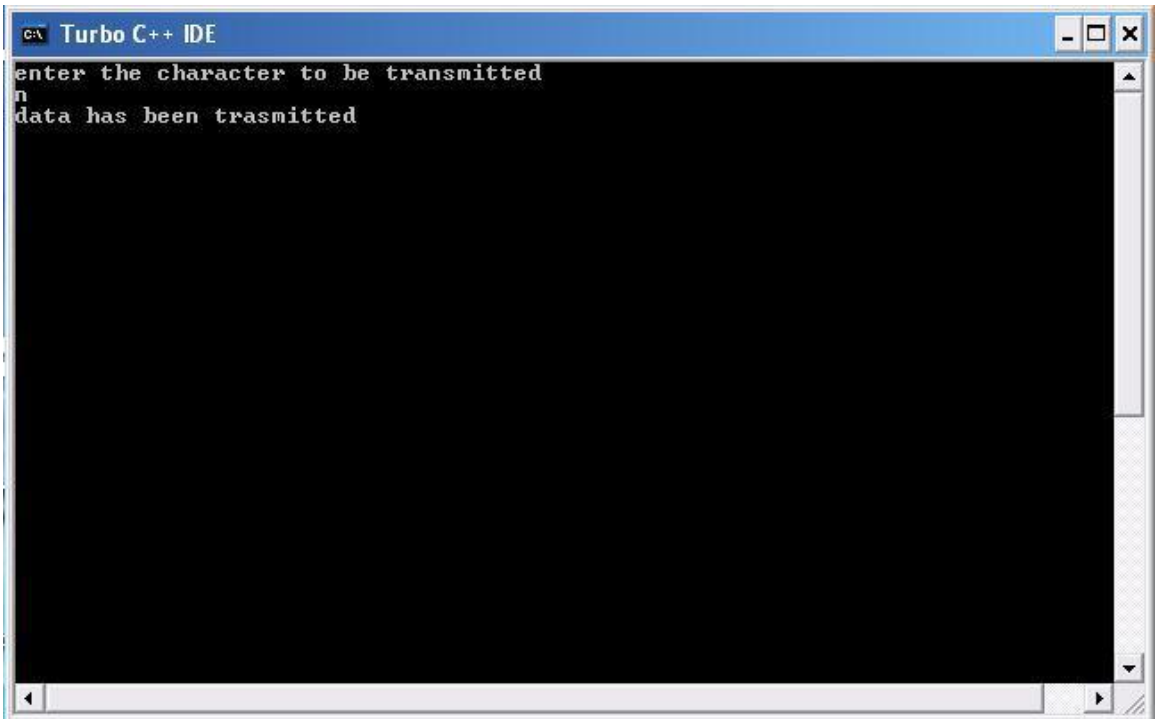
Compiling the Program:



Transmitter side:



Receiver Side:



4 Conclusions

This EXPERIMENT- mentions the basic requirements that how the data can be transmitted between two machines. Modifications can be done accordingly if a string or either a file has to be transmitted.

EXPERIMENT-1

Aim: Write a Program to transfer a character,a string and a file from one PC to another.

(C/C++) Tools / Apparatus: RS-232 9 pin female connector cable.

Procedure: Include <iostream.h>,<conio.h>,<io.h> files both in transmitter & receiver programs.

Load the desired pattern in LCR (Hex 3FB) register.

Load a 16 bit binary number in the two baud rate divisor registers (Hex 3F8 and 3F9) by two out instructions.

During the transmission, the program waits for the THRE & TSRE bits. Once these bits become high, the program can issue one character of data to the TDR.

During receive operation the program should read the data from RDR once the DR bit in the LSR is high.

Program should also verify that the PE & FE bits in the LSR are zero.

If the BI bit in the LSR is high, it is an indication that the other end wants to interrupt this end.

EXPERIMENT- 2

Aim: Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.

Apparatus (Components): RJ-45 connector, Climping Tool, Twisted pair Cable

Procedure: To do these practical following steps should be done:

1. Start by stripping off about 2 inches of the plastic jacket off the end of the cable. Be very careful at this point, as to not nick or cut into the wires, which are inside. Doing so could alter the characteristics of your cable, or even worse render is useless. Check the wires, **one more time** for nicks or cuts. If there are any, just whack the whole end off, and start over.

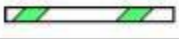
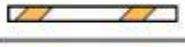
2. Spread the wires apart, but be sure to hold onto the base of the jacket with your other hand. You do not want the wires to become untwisted down inside the jacket. Category 5 cable must only have 1/2 of an inch of 'untwisted' wire at the end; otherwise it will be 'out of spec'. At this point, you obviously have ALOT more than 1/2 of an inch of un-twisted wire.

3. You have 2 end jacks, which must be installed on your cable. If you are using a pre-made cable, with one of the ends whacked off, you only have one end to install - the crossed over end. Below are two diagrams, which show how you need to arrange the cables for each type of cable end. Decide at this point which end you are making and examine the associated picture below.

Diagram shows you how to prepare Cross wired connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

Diagram shows you how to prepare straight through wired connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

EXPERIMENT- 3

Aim: Write a program to implement bit stuffing and character stuffing.
Apparatus (Software): Turbo C, C++, RS-232 9 pin female connector cable Procedure:

Bit Stuffing

Include <iostream.h>,<conio.h>,<io.h> files both in transmitter & receiver programs.

During the transmission, attach a flag pattern (01111110) at the start & end of data unit.

If transmitter sees five consecutive one's in data, it stuffs zero bit in data.

At the receiving end, whenever in data it finds five consecutive one's and the next bit are zero then the receiver will de stuff that zero bit.

e.g. If the Pattern to be transmitted is 00011110111110000, then at the transmitter side will be 000111101111100000 because as 5 consecutive 1's are detected, one 0 should be stuffed and at the receiver side again as it will detect 0 after 5 consecutive 1's , it will destuff it.

Character Stuffing

Include <iostream.h>,<conio.h>,<io.h> files both in transmitter & receiver programs.

This is type of Framing Method.

During the transmission attach a ASCII Code pattern DLE STX at the start & DLE ETX end of data Unit.

If transmitter sees DLE stuff another DLE text in data.

At the receiving end, whenever the data it finds five consecutive DLE then receiver will destuff One DLE.

EXPERIMENT- 4

Aim: Study of following Network Devices in Detail

Repeater
Hub
Switch
Bridge
Router
Gate Way

Apparatus (Software): No software or hardware needed.

Procedure: Following should be done to understand this practical.

1. **Repeater:**Functioning at Physical Layer.A **repeater** is an electronic device that receives a signal and retransmits it at a higher level and/or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances.Repeater have two ports ,so cannot be use to connect for more than two devices
2. **Hub:** An **Ethernet hub**, **active hub**, **network hub**, **repeater hub**, **hub** or **concentrator** is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment. Hubs work at the physical layer (layer 1) of the OSI model. The device is a form of multiport repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.
3. **Switch:**A **network switch** or **switching hub** is a computer networking device that connects network segments.The term commonly refers to a network bridge that processes and routes data at the data link layer (layer 2) of the OSI model. Switches that additionally process data at the network layer (layer 3 and above) are often referred to as Layer 3 switches or multilayer switches.

4. **Bridge:** A **network bridge** connects multiple network segments at the data link layer (Layer 2) of the OSI model. In Ethernet networks, the term *bridge* formally means a device that behaves according to the IEEE 802.1D standard. A bridge and switch are very much alike; a switch being a bridge with numerous ports. *Switch* or *Layer 2 switch* is often used interchangeably with *bridge*.Bridges can analyze incoming data packets to determine if the bridge is able to send the given packet to another segment of the network.
5. **Router:** A **router** is an electronic device that interconnects two or more computer networks, and selectively interchanges packets of data between them. Each data packet contains address information that a router can use to determine if the source and destination are on the same network, or if the data packet must be transferred from one network to another. Where multiple routers are used in a large collection of interconnected networks, the routers exchange information about target system addresses, so that each router can build up a table showing the preferred paths between any two systems on the interconnected networks.

6. **Gate Way:** In a communications network, a network node equipped for interfacing with another network that uses different protocols.

   A gateway may contain devices such as protocol translators, impedance matching devices, rate converters, fault isolators, or signal translators as necessary to provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between both networks.
   A protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing the required protocol conversions.

EXPERIMENT- 5

Aim: Study of network IP

Classification of IP address

Sub netting

Super netting

Apparatus (Software): NA

Procedure: Following is required to be study under this practical.

Classification of IP address

As show in figure we teach how the ip addresses are classified and when they are used.

Class	Address Range	Supports
Class A	1.0.0.1 to 126.255.255.254	Supports 16 million hosts on each of 127 networks.
Class B	128.1.0.1 to 191.255.255.254	Supports 65,000 hosts on each of 16,000 networks.
Class C	192.0.1.1 to 223.255.254.254	Supports 254 hosts on each of 2 million networks.
Class D	224.0.0.0 to 239.255.255.255	Reserved for multicast groups.
Class E	240.0.0.0 to 254.255.255.254	Reserved.

Sub netting

Why we Develop sub netting and How to calculate subnet mask and how to identify subnet address.

Super netting

Why we develop super netting and How to calculate supernet mask and how to identify supernet address.

EXPERIMENT- 6

Aim: Study of basic network command and Network configuration commands.
Apparatus (Software): Command Prompt And Packet Tracer.

Procedure: To do this EXPERIMENT- follows these steps:

In this EXPERIMENT- students have to understand basic networking commands e.g ping, tracert etc.

All commands related to Network configuration which includes how to switch to privilege mode and normal mode and how to configure router interface and how to save this configuration to flash memory or permanent memory.

This commands includes

- Configuring the Router commands
  - General Commands to configure network Privileged Mode commands of a router Router Processes & Statistics
- IP Commands
- Other IP Commands e.g. show ip route etc.

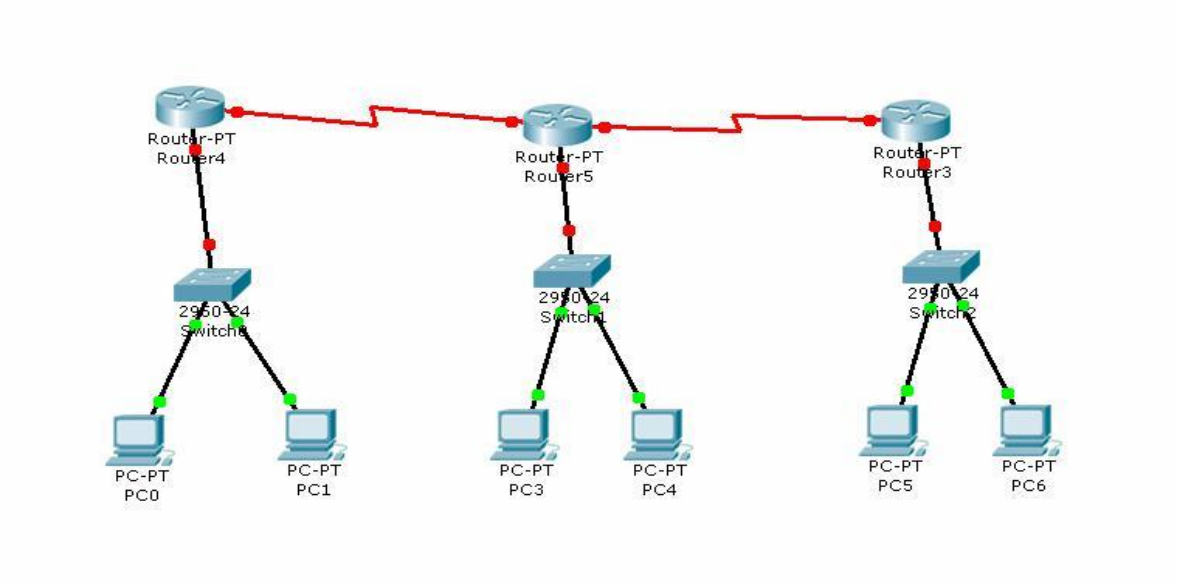
EXPERIMENT- 7

Aim: Configure a Network topology using packet tracer software.

Apparatus (Software): Packet tracer Software

Procedure: To implement this practical following network topology is required to be configured using the commands learned in previous practical.

After configuring the given network a packet should be ping from any one machine to another.



EXPERIMENT- 8

Aim: Configure a Network using Distance Vector Routing protocol.

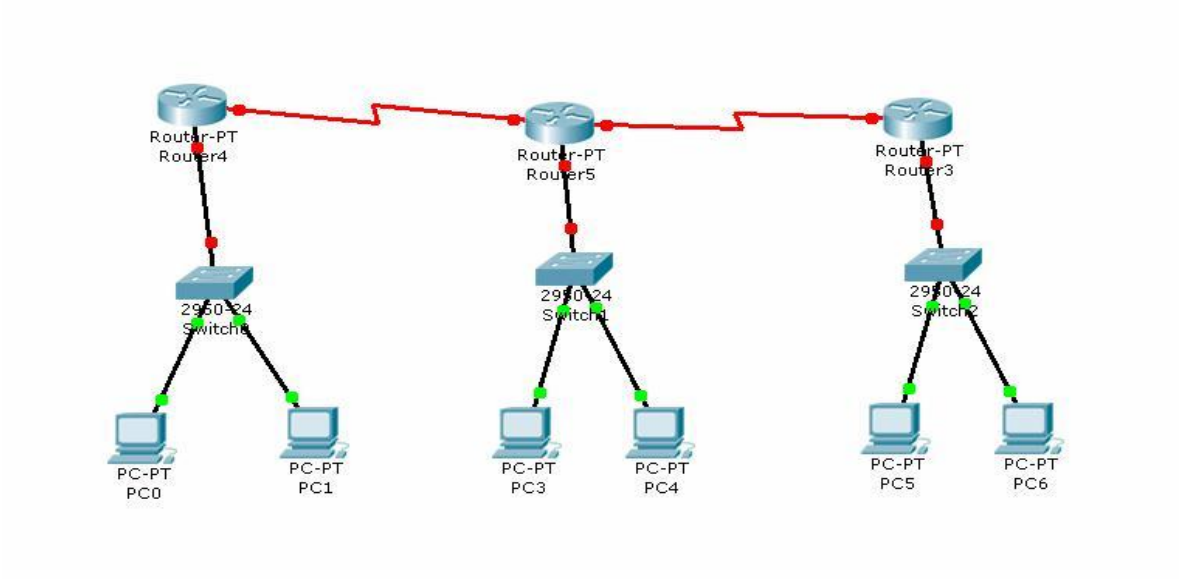
RIP

IGRP(Case Study)

Apparatus (Software): packet tracer software

Procedure:

1. Develop a Topology shown in figure given below.
2. Configure all the workstations
3. Configure all switches
4. Configure all Routers
5. Implement RIP protocols in Router to configure Network.



EXPERIMENT- 9

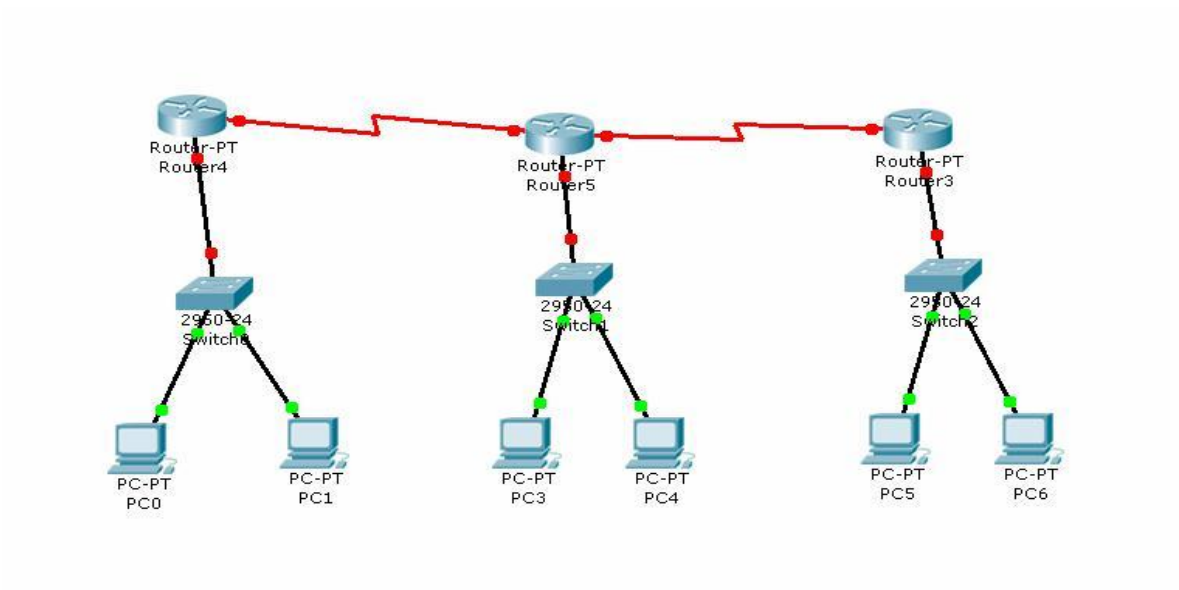
Aim: Configure Network using Link State Vector Routing protocol.

OSPF

Apparatus (Software): Packet Tracer Software

Procedure:

1. Develop a Topology shown in figure given below.
2. Configure all the workstations
3. Configure all switches
4. Configure all Routers
5. Implement OSPF protocols in Router to configure Network.



EXPERIMENT- 10

Aim: Write a program to implement TCP/IP protocol using socket programming using UNIX.

Apparatus (Software): UNIX operating System

Procedure:

1. Server - establishing a listening socket
2. Client - connecting to the server
3. Server - accepting the client's connection attempt
4. Client and Server - sending and receiving data
5. Compiling and Testing Our Client And Server

EXPERIMENT-11

Aim: Implement Bellman Ford's Algorithm.

Procedure: Include <dos.h>,<conio.h>,<stdlib.h>,<stdio.h>

The complete graph is drawn.

The distance between two consecutive nodes is noted.

The distance between the source node and the adjacent nodes are observed. The minimum adjacent node is marked as permanent.

Now the distance of the source node at any given time is taken onto consideration and the distances are recalculated again with respect to the present source node.

The minimal distance adjacent node is marked as permanent.

Then the path from source to destination node via all intermediate permanent nodes will be the shortest path.

EXPERIMENT-12

Aim: Connect the computers in Local Area Network.

Procedure: **On the host computer**

On the host computer, follow these steps to share the Internet connection:

1. Log on to the host computer as Administrator or as Owner.
2. Click **Start**, and then click **Control Panel**.
3. Click **Network and Internet Connections**.
4. Click **Network Connections**.
5. Right-click the connection that you use to connect to the Internet. For example, if you connect to the Internet by using a modem, right-click the connection that you want under Dial-up / other network available.
6. Click **Properties**.
7. Click the **Advanced** tab.
8. Under **Internet Connection Sharing**, select the **Allow other network users to connect through this computer's Internet connection** check box.
9. If you are sharing a dial-up Internet connection, select the **Establish a dial-up connection whenever a computer on my network attempts to access the Internet** check box if you want to permit your computer to automatically connect to the Internet.
10. Click **OK**. You receive the following message:

    When Internet Connection Sharing is enabled, your LAN adapter will be set to use IP address 192.168.0.1. Your computer may lose connectivity with other computers on your network. If these other computers have static IP addresses, it is a good idea to set them
    to obtain their IP addresses automatically. Are you sure you want to enable Internet Connection Sharing?

11. Click **Yes**.

The connection to the Internet is shared to other computers on the local area network (LAN). The network adapter that is connected to the LAN is configured with a static IP address of 192.168.0.1 and a subnet mask of 255.255.255.0

On the client computer

To connect to the Internet by using the shared connection, you must confirm the LAN adapter IP configuration, and then configure the client computer. To confirm the LAN adapter IP configuration, follow these steps:

1. Log on to the client computer as Administrator or as Owner.
2. Click **Start**, and then click **Control Panel**.
3. Click **Network and Internet Connections**.
4. Click **Network Connections**.
5. Right-click **Local Area Connection** and then click **Properties**.
6. Click the **General** tab, click **Internet Protocol (TCP/IP)** in the **connection uses the following items** list, and then click **Properties**.
7. In the **Internet Protocol (TCP/IP) Properties** dialog box, click **Obtain an IP address automatically** (if it is not already selected), and then click **OK**.

   Note: You can also assign a unique static IP address in the range of 192.168.0.2 to 192.168.0.254. For example, you can assign the following static IP address, subnet mask, and default gateway:

8. IP Address 192.168.31.202
9. Subnet mask 255.255.255.0
10. Default gateway 192.168.31.1

11. In the **Local Area Connection Properties** dialog box, click **OK**.
12. Quit Control Panel.

References

Reference Books:

1. PC and CLONES by Govind RajaLu
2. Data communication and Networking by Behrouz a Forouzan
3. CCNA: Cisco Certified Network Associate Study Guide

Reference Website:

1. http://www.littlewhitedog.com/content-8.html
2. http://en.wikipedia.org
3. http://www.networktutorials.info/router_commands.html