

**VISVESVARAYA TECHNOLOGICAL
UNIVERSITY**

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB RECORD

Computer Networks Laboratory(23CS5PCCON)

Submitted by

Ayman Amjad(1BM22CS061)

in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

BENGALURU-560019

Sep 2024-Jan 2025

**B. M. S. College of Engineering,
Bull Temple Road, Bangalore 560019**
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled "**COMPUTER NETWORKS**" carried out by **Ayman Amjad(1BM22CS061)**, who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2024-25. The Lab report has been approved as it satisfies the academic requirements in respect of **Computer Networks Lab - (23CS5PCCON)** work prescribed for the said degree.

Dr. Nandhini Vineeth

Associate Professor,
Department of CSE,
BMSCE, Bengaluru

Dr. Kavitha Sooda

Professor and Head,
Department of CSE
BMSCE, Bengaluru

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CYCLE-1

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Github Link: <https://github.com/AymanAmjad/CNN.git>

LABORATORY PROGRAM – 1

Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.

25/9/24

Lab-1
Hub

Aim: To demonstrate the transmission of a simple PDU between 2 devices connected using a hub and a switch

Diagram:

Legend:
green connection successful

IP 192.160.1/24 port link 1 IP 192.160.2/24 port link 2 IP 192.160.3/24 port link 3

Observation / procedure

Setup

1. Launch Cisco packet tracer
2. Add devices. Left icon menu → select end devices → add 3 PCs
- ✓ 3. Connect devices: Use copper straight through cable to connect each PC to the hub, establish the connection should turn from red to green.
4. IP config:
go to > each device right click → select config → then port ethernet (1) do this for all 3 PCs
by address value.

Subnet mask

PC1	192.160.1/24	255.255.255.0
PC2	192.160.2/24	255.255.255.0
PC3	192.160.3/24	255.255.255.0

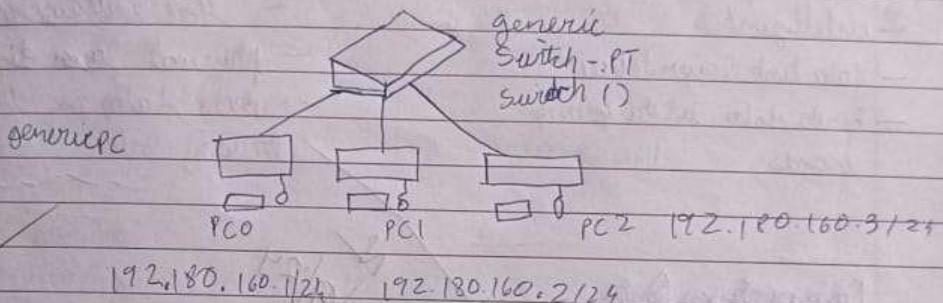
switch to simulation from real time at the right bottom
add simple PDU
envelope click on the source PC 0 & destination PC 2
this will create an ICMP packet from PC1 to PC2

7) run the simulation / click auto capture / play

Result (observation)

- from PC0 to P2 & P1
the PDU (protocol data unit)
 - return msg/ PDU is sent from P2 to PC0 that it is received.
 - but only PC2 will accept the PDU hence X mark on P1
- Since it is hub ~~loop~~
Broadcast happens to all connected to hub only intended PC will be received

Switch Connecting PC to switch.

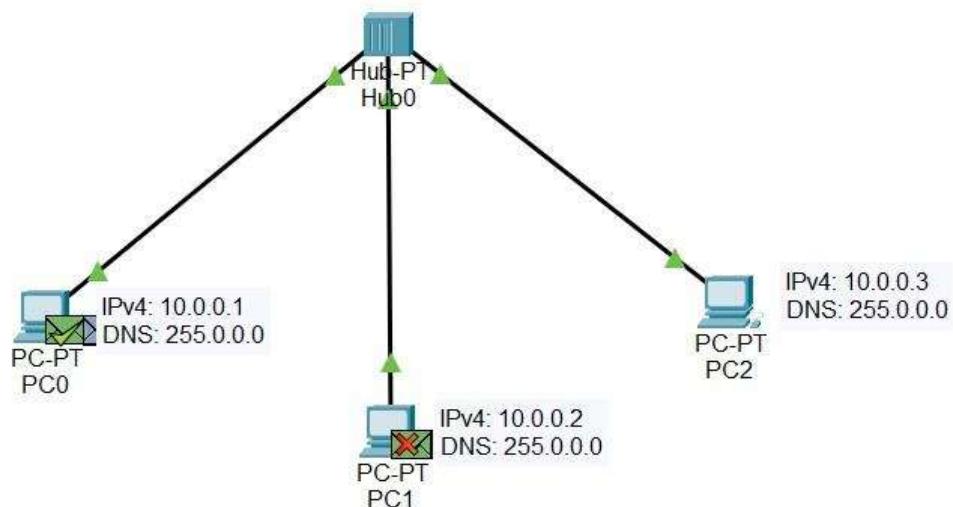


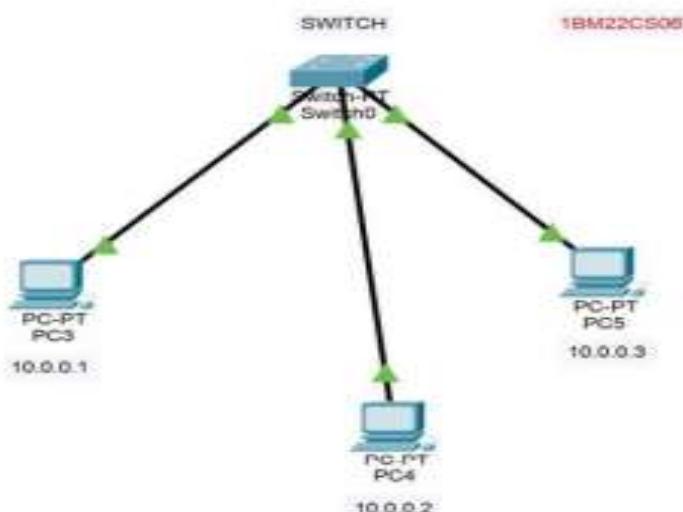
Observation / Procedure

1. open Cisco packet tracer.
2. Add devices.
switch → Network devices
Network devices - (generic switch)
end devices -
generic PC
3. Connect the 3 PCs 1, 2 to switch ports using copper straight through
4. setup devices by providing ips
Get Ic config → fast ethernet → input i/p

IP 1	192.180.160.1
IP 2	192.180.160.2
IP 3	192.180.160.3

- M T W T F S
PAGE NO.:
Date: YOUNA
- 5) switch see simulation mode choose wireless event / packet
 - 6) Add PDU to source & destination to PC 2
 - 7) run simulation Auto capture (play)
 - i) CnN (ping) are sent to only correct device with correct device mac.
 - 8) Result switch uses mac addresses to intelligently forward the ping (ICMP) packets to the correct destination rather than broadcasting to all connected devices like a hub would
- Observation difference
- | | |
|--|--|
| Switches <ul style="list-style-type: none"> - direct to mac - intelligent - data link layer device - renders data in the form of frames | Hubs <ul style="list-style-type: none"> - broadcast model - Not intelligent - physical layer device - sends data in the form of binary bits |
|--|--|
- QUESTION ANSWER
- R
25/09/21





Realtime **Simulation**

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	IC...		0.000	N	0	(e...)	(del)
	Successful	PC3	PC5	IC...		0.000	N	1	(e...)	(del)

Toggle PDU List Window

Command Prompt

```

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

LABORATORY PROGRAM – 2a

Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.

Configure IP address to routers in packet tracer. Explore the following msg: ping responses, destination unreachable, request timed out, reply.

single Router

9/10/24 Connect 2 PC using router

Aim: To demonstrate the connection between two computers and an end device in two different subnets using the router.

Procedure

- 1) Open Cisco package tracer.
- 2) Add the end devices & the router from the left hand icon menu.
- 3) Connect the device: use a copper crossover cable to connect each PC to the router.
- 4) ip config: on each device → go to config → fastethernet
enter IP

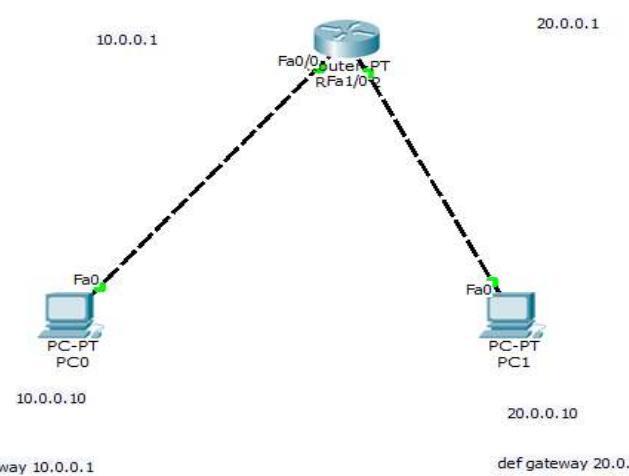
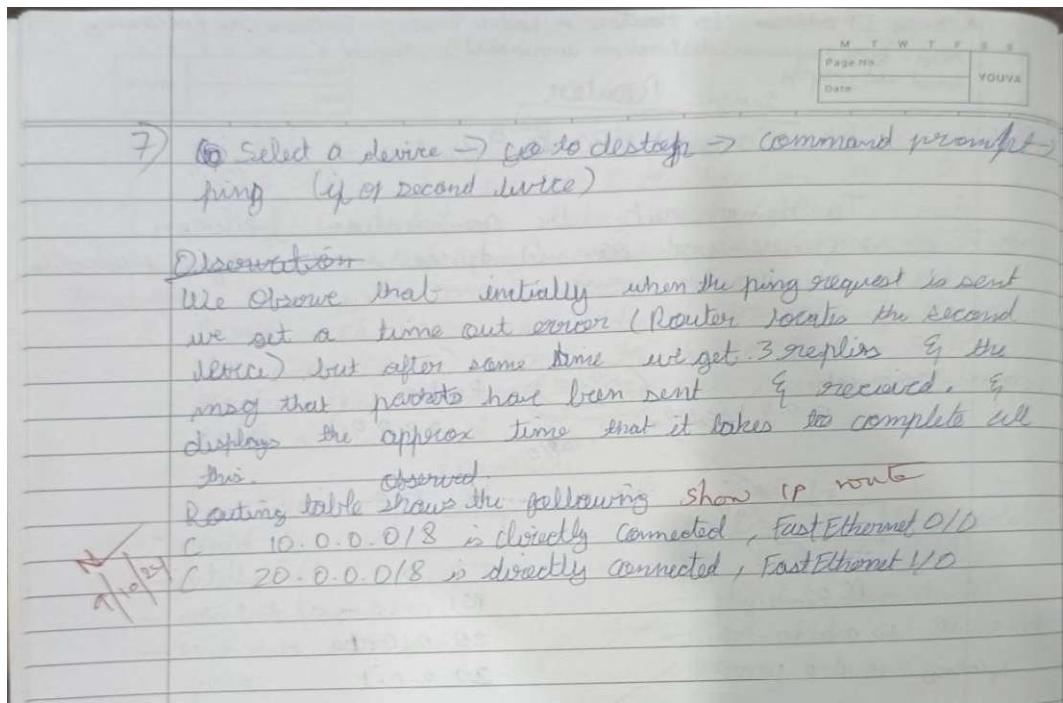
PC0	IP 10.0.0.10	255.0.0.0
PC1	IP 20.0.0.10	255.0.0.0

change Gateways

PC0	10.0.0.1
PC1	20.0.0.1

- 5) Router config → go to Cli → ~~type~~ Enter the following commands
no → enable → config terminal → interface fastethernet 0/0 → ip address 10.0.0.1 255.0.0.0 → no shutdown → exit
(repeat for second device) output show IP route.
- 6) Setup is complete.

C 10.0.0.0/8 is directly connected, fastethernet 0/0
C 20.0.0.0/8 is directly connected, fastethernet 1/0



PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.10

Pinging 20.0.0.10 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>ping 20.0.0.10

Pinging 20.0.0.10 with 32 bytes of data:

Reply from 20.0.0.10: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss).
```

PC2

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Request timed out.
Reply from 10.0.0.10: bytes=32 time=0ms TTL=127
Reply from 10.0.0.10: bytes=32 time=0ms TTL=127
Reply from 10.0.0.10: bytes=32 time=0ms TTL=127

Ping statistics for 10.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>|
```

LABORATORY PROGRAM – 2b

Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.

1/10/24

Q Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.

Aim To demonstrate the connection between two end devices in two different networks using two routers.

Procedure:

- 1) Open packet tracer.
- 2) Add two routers & two end devices.
- 3) Connect them using Copper crossover (router - device) & Serial DCE (router - router).
- 4) IP config for each device

PC0	PC2
IP 10.0.0.10	20.0.0.10
Subnet 255.0.0.0	255.0.0.0
Gateway 10.0.0.1	20.0.0.1

- 5) Router cli → Enter → No → Enable → config terminal
→ Enter → interface FastEthernet0/0 or serial 2/0 (for router to router) → Enter IP & subnet
→ No shutdown edit → Exit

Q) Go to device \rightarrow desktop \rightarrow Command prompt \rightarrow ping the device

Result:

Show IP Route

- S* 10.0.0.0/8 [1/0] via 30.0.0.1
- C 30.0.0.0/8 is directly connected, Serial 2/0
- o C 20.0.0.0/8 is directly connected, FastEthernet0/0
- C 10.0.0.0/8 is directly connected, FastEthernet0/0

Ping 10.0.0.1

XG Destination host unreachable

Ping 10.0.0.1

XG Reply from 10.0.0.1: bytes, time <TTL

Same forecast

Ping 20.0.0.10

Reply from 20.0.0.10 Destination host unreachable

Reply from 20.0.0.10 Destination host unreachable

Reply from 20.0.0.10 Destination host unreachable

Int Cli of Router

Config IP route 20.0.0.0 255.0.0.0 30.0.0.2

In Command Prompt of R1

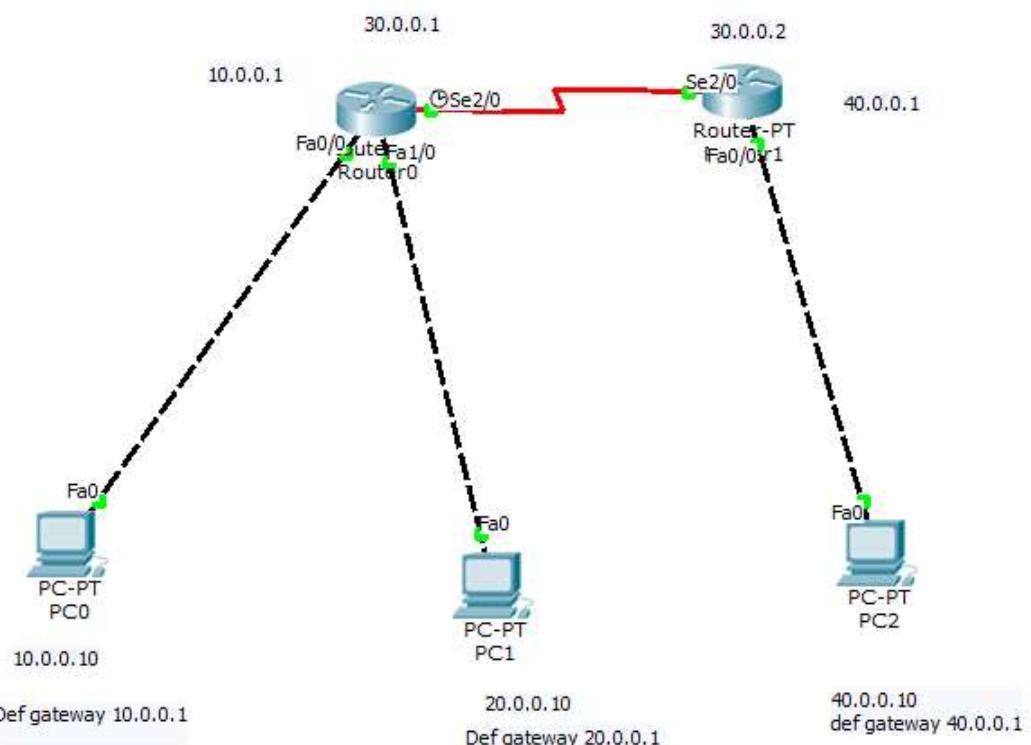
Ping 20.0.0.10

N
16/10/21

Request from R1

Reply from 20.0.0.10: bytes=32 time=8ms TTL=125

11 6 11 7 6 11



PC0

Physical Config Desktop Custom Interface

Command Prompt

```

Packet Tracer PC Command Line 1.0
PC> ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 40.0.0.10:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC> ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 40.0.0.10:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>

```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

S    10.0.0.0/8 [1/0] via 30.0.0.1
C    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Router0

Physical Config CLI

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, FastEthernet1/0
C    30.0.0.0/8 is directly connected, Serial2/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
Router#
```

PC7

Physical Config Desktop Custom Interface

Command Prompt

```
PC>ping 10.0.0.1
Pinging 10.0.0.1 with 32 bytes of data:
Reply from 10.0.0.1: bytes=32 time=3ms TTL=126
Reply from 10.0.0.1: bytes=32 time=6ms TTL=126
Reply from 10.0.0.1: bytes=32 time=4ms TTL=126
Reply from 10.0.0.1: bytes=32 time=6ms TTL=126

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 6ms, Average = 4ms
```

PC4

Physical Config Desktop Custom Interface

Command Prompt

```
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.1: bytes=32 time=5ms TTL=126
Reply from 20.0.0.1: bytes=32 time=7ms TTL=126
Reply from 20.0.0.1: bytes=32 time=5ms TTL=126

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 5ms, Maximum = 7ms, Average = 6ms
```

LABORATORY PROGRAM – 3

Configure default route, static route to the Router.

23/10/24 Lab -3

M T W T F S
Page No.: YOUVA
Date:

A Configure default routes, static routes to the Router

Aim: To demonstrate static routing & Default Routing using 3 routers & 2 PC's.

Topo:

Router R1: IP 20.0.0.1, Fa0/0, IP 10.0.0.10, GW 10.0.0.1

Router R2: IP 40.0.0.1, Fa0/0, IP 40.0.0.10, GW 40.0.0.1

Router R3: IP 30.0.0.1, Fa0/0, IP 30.0.0.10, GW 30.0.0.1

Procedure

- 1) Open Cisco Packet Tracer
- 2) Drag & drop all devices (3 routers & two PC's)
- 3) Use Copper crossover cable for router to PC & Serial DCE for router to router
- 4) Enter IP addresses & gateways to the PC's
- 5) Go to router → CLI → No → Enable → config terminal → interface fastEthernet 0/0 → IP address subnet → No Shut → wait. (For PC connection)
- 6) CLI → config terminal → interface serial 2/0 → IP address subnet → No Shut → exit. (for all routers)
- 7) Select a device → PostOp. → cmd prompt → Ping the other device

M	T	W	T	F	S	S
Page No.:						
DME						YOUNA

8) For middle router \rightarrow Cli \rightarrow Config \rightarrow

IP Route 10.0.0.0 255.0.0.0 20.0.0.1

\rightarrow IP Route 10.0.0.0 255.0.0.0 30.0.0.2

\rightarrow exit (static routing)

9) For left & right routers \rightarrow Cli \rightarrow Config \rightarrow

IP route 0.0.0.0 0.0.0.0 20.0.0.2 (For left)

\rightarrow IP route 0.0.0.0 0.0.0.0 30.0.0.1 (for right)

\rightarrow exit

10) Now go to PC \rightarrow Desktop \rightarrow Cmd \rightarrow Ping.

Observation:

Initial Ping On PC 1

Ping 40.0.0.10

Reply from 40.0.0.1: Destination host unreachable.

"

"

Request timed out.

After Static routing & Default routing -

Show IP route (for Router 2)

S 10.0.0.0/8 [1/0] via 20.0.0.1

C 20.0.0.0/8 is directly connected, Serial 2/0

C 30.0.0.0/8 , Serial 3/0

S 40.0.0.0/8 [1/0] via 30.0.0.2

(for Router 1)

C 10.0.0.0/8 is directly connected, Fast Ethernet 0/0

C 20.0.0.0/8 , Serial 2/0

S* 0.0.0.0/0 [1/0] via 20.0.0.2

\rightarrow

M	T	W	T	F	S	S
Page No.:	YOUVA					
Date:						

(Router 3)

C 30.0.0.0/8 is directly connected, Serial 2/0

C 10.0.0.0/0 " FastEthernet 0/0

S* 0.0.0.0/0 [1/0] via 30.0.0.1

In PC1 (cmd)

(After static & Default Routing Step 2 & 3)

Ping 40.0.0.10

Request timed out

Reply from 40.0.0.10: bytes = 32 time = 6ms TTL = 125

Ping Statistics

In PC2 (cmd)

Ping 10.0.0.10

Reply from 10.0.0.10 bytes = 32 time = 8ms TTL = 125

Ping Statistics

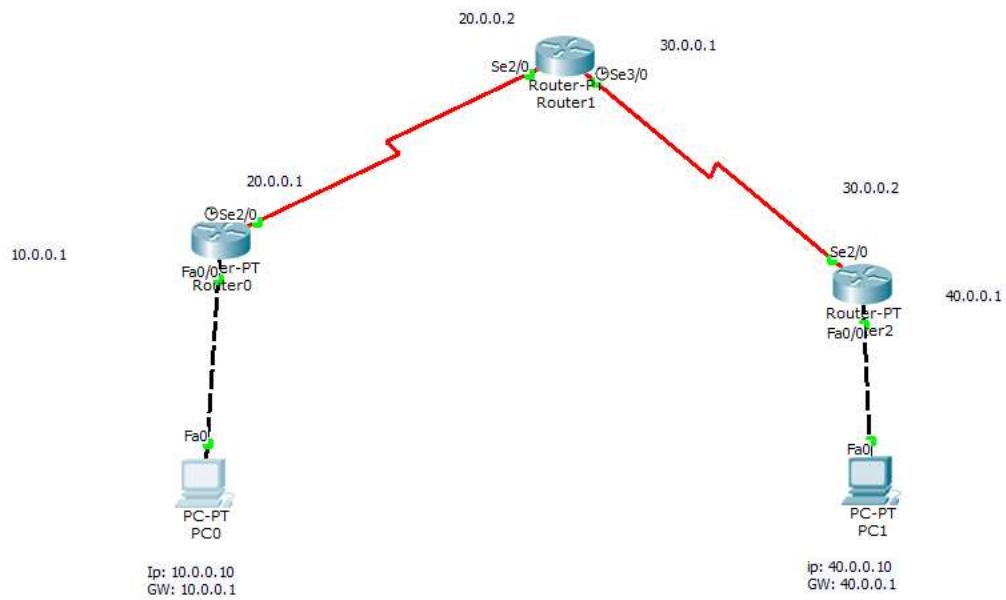
Observation

We observe that initially even after the initial configuration for routers & PCs are completed the Ping out from out unreachable. But after performing static routing for the middle router & default routing for the ones connected to the PCs, we get a positive Ping reply in both ways, thus a connection is successfully established.

N
23/10/24

Static Routing is done to specify the complete route for data transmission

Default Routing is done when source can be anything but destination is specified for data transmission.



PC0

Physical Config Desktop Custom Interface

Command Prompt

```

Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>

```

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

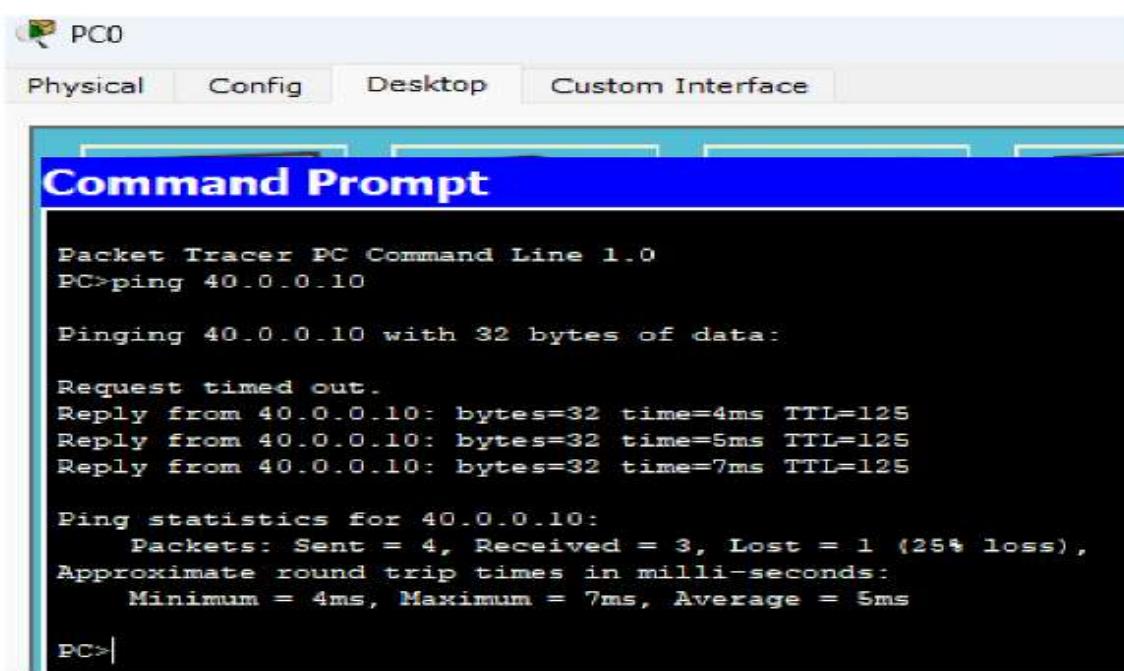
Gateway of last resort is not set

C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
```

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

S    10.0.0.0/8 [1/0] via 20.0.0.1
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
Router#
```



Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time=8ms TTL=125
Reply from 10.0.0.10: bytes=32 time=9ms TTL=125
Reply from 10.0.0.10: bytes=32 time=5ms TTL=125
Reply from 10.0.0.10: bytes=32 time=7ms TTL=125

Ping statistics for 10.0.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 5ms, Maximum = 9ms, Average = 7ms

PC>

LABORATORY PROGRAM – 4

Configure DHCP within a LAN and outside LAN.

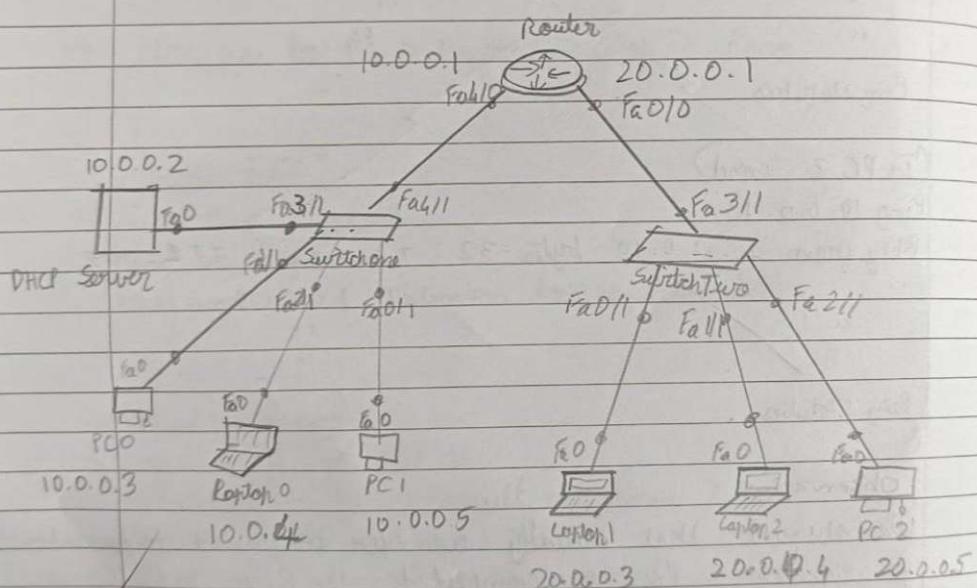
1311124

Lah - 4

Q Configure DHCP within LAN & outside LAN

AIM: To Use Server to ~~not~~ give systems IP addresses through DHCP within 2 different Networks.

Topology



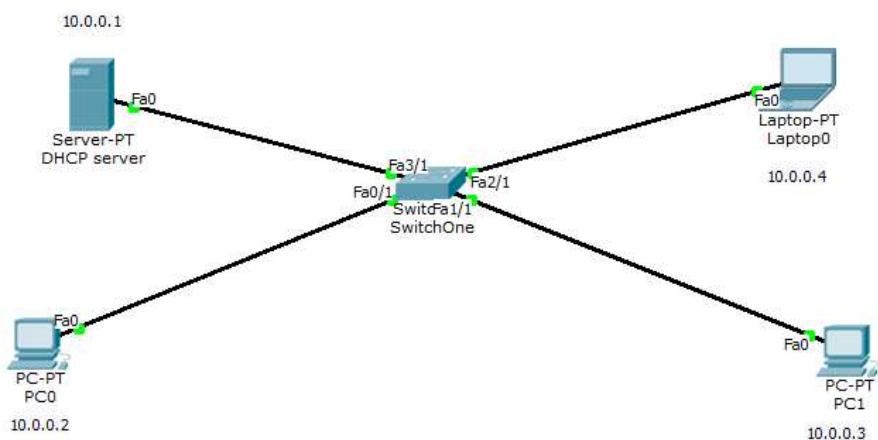
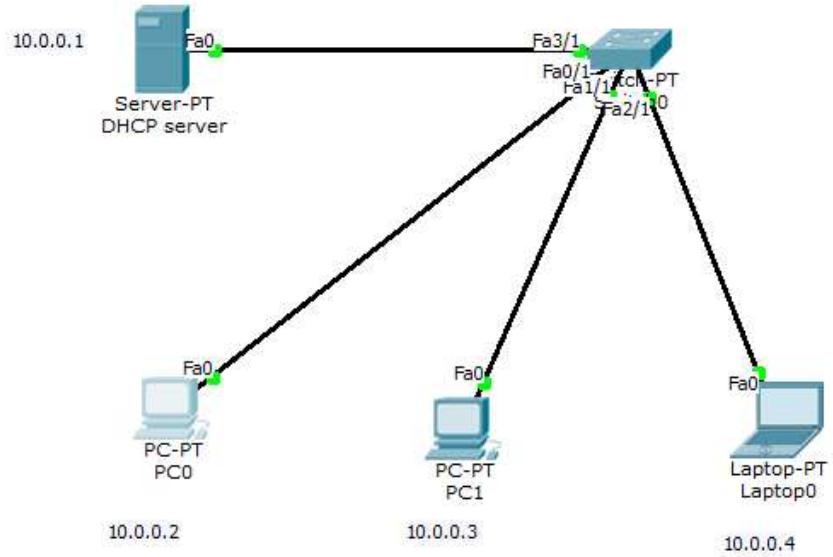
Powdure

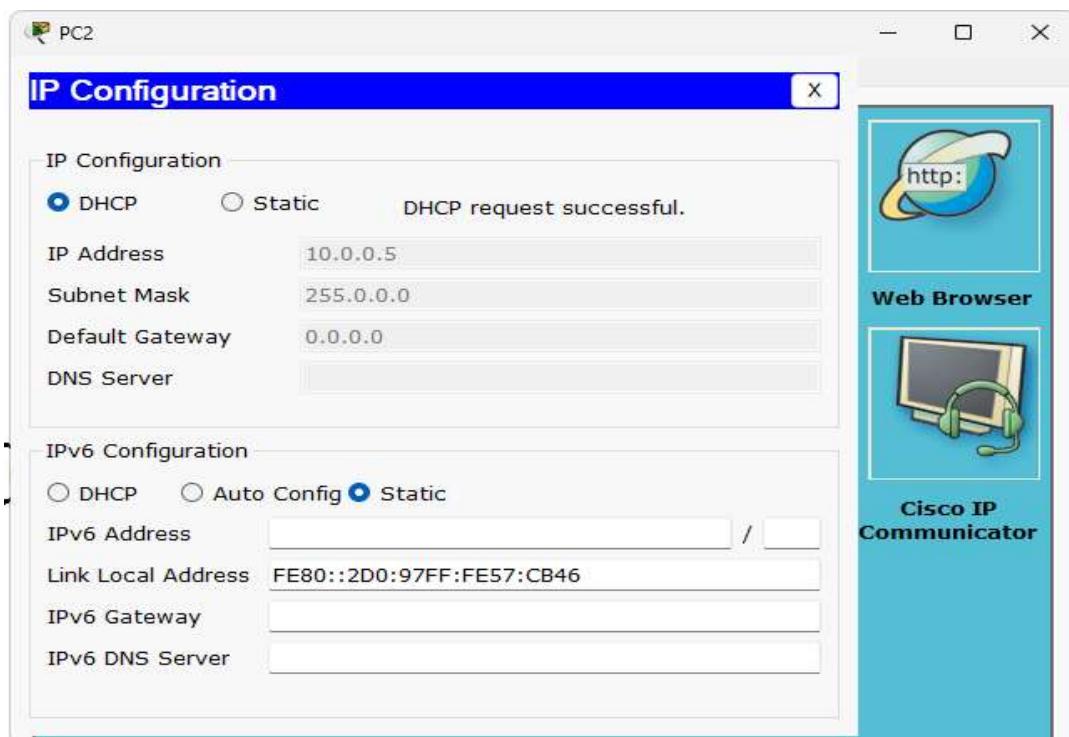
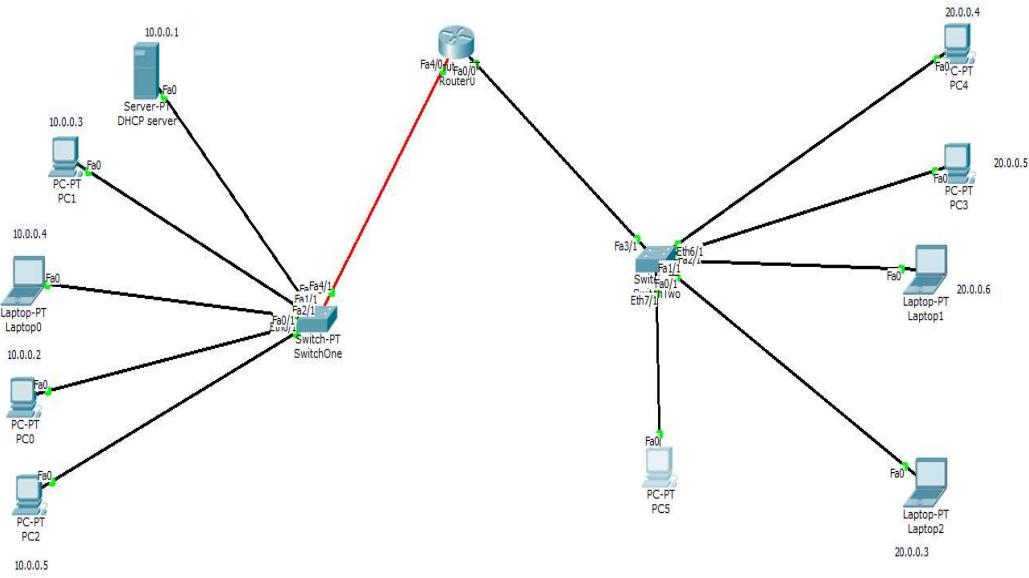
(U) ~~15m~~ 15m

- 1) Open Cisco packet tracer
 - 2) Drag & drop the devices (and devices & server)
 - 3) Connect them using switch (Copper straight Through)
 - 4) In Server → Desktop → IP config → set IP 10.0.0.2
& Gateway 10.0.0.1 & subnet
 - 5) In config → Services → DHCP → Create Pool name
Set Gateway 10.0.0.1, Start IP 10.0.0.3 & Max
Pool to 100 & add.

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Q) Go to Each end device \rightarrow desktop \rightarrow IP Config \rightarrow Click DHCP mode \rightarrow IP will be assigned.						
Result: Inv an enddevice \rightarrow cmd. Ping 10.0.0.4 Pinging 10.0.0.4 with 32 bytes of data: Reply from 10.0.0.4: bytes=32 time=0ms TTL=128 Ping statistics.						

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<u>Observation</u> We Learn That we can use the Server to assign the IP address to any device connected to the Server within LAN or outside the LAN through DHCP.						
NB 13/11/21						





PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>10.0.0.3
Invalid Command.

PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>
```

DHCP server

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer SERVER Command Line 1.0
SERVER>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=3ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 0ms

SERVER>
```

```

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa4/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#ip helper-address 10.0.0.2
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet4/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0, changed state to
o up

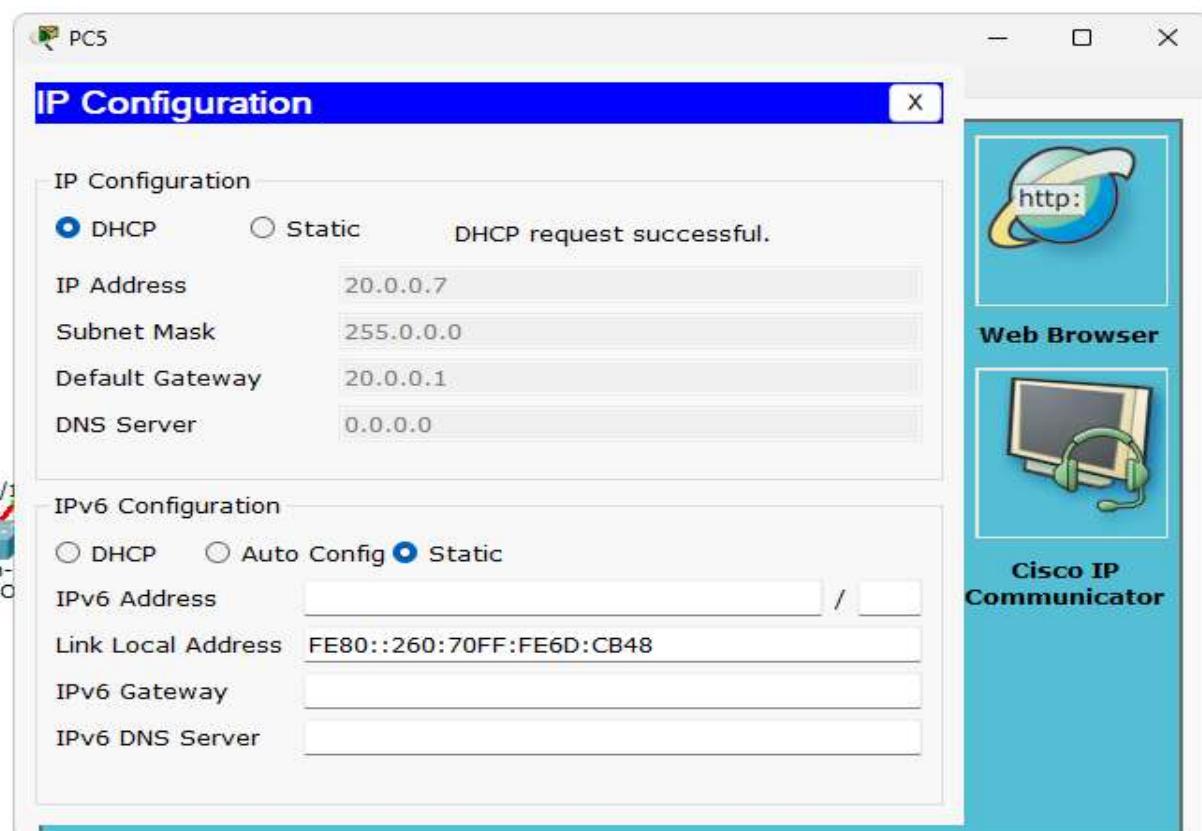
Router(config-if)#exit
Router(config)#interface fa0/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#ip helper-address 10.0.0.2
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
o up

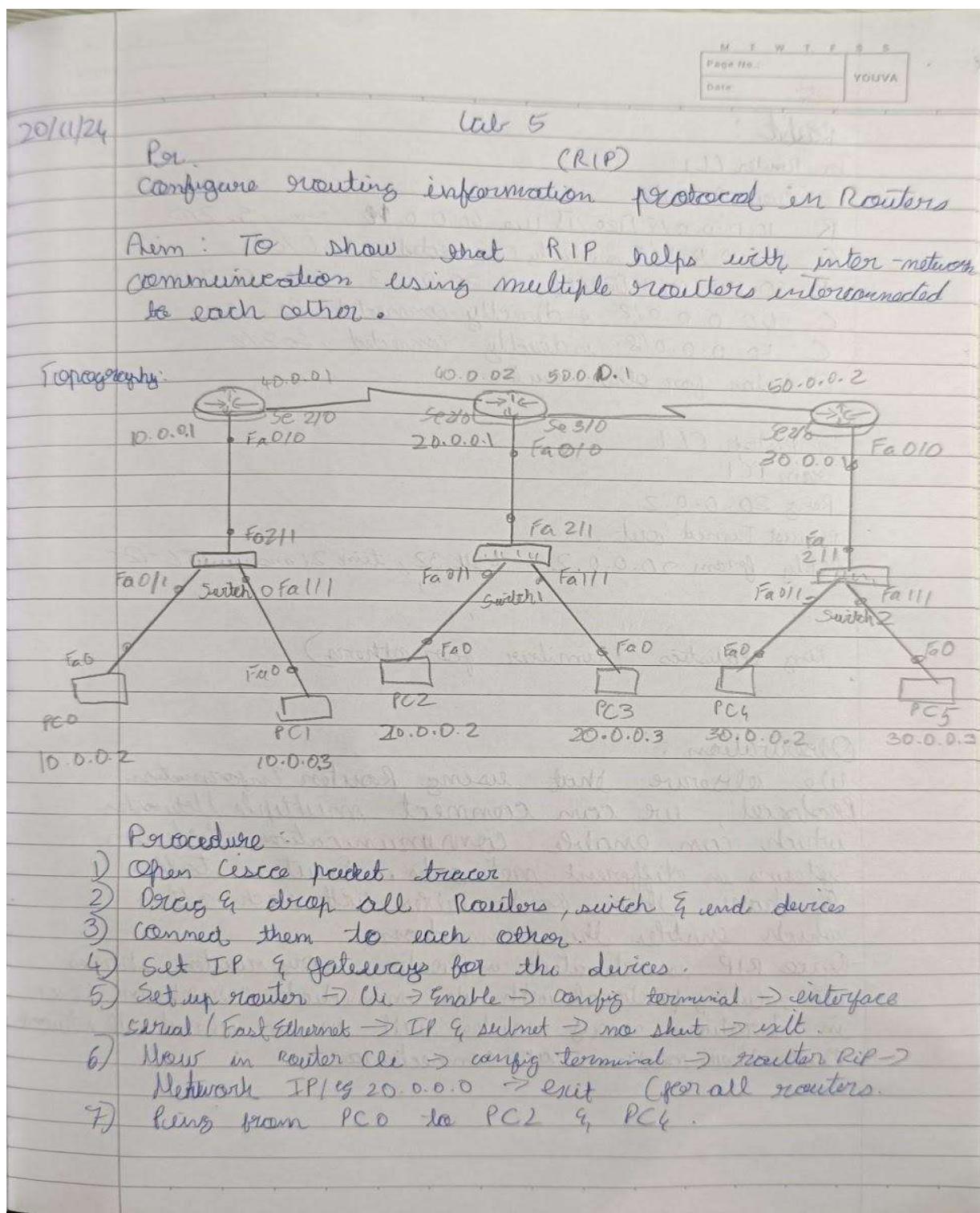
Router(config-if)#exit
Router(config)#

```



LABORATORY PROGRAM – 5

Configure RIP routing Protocol in Routers



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Result :

In Router CL1

→ Show IP Route.

R 10.0.0.0/8 [20/1] via 40.0.0.10, time, Se 2/0

C 20.0.0.0/8 is directly connected, Fa 0/0

R 30.0.0.0/8 [20/1] via 50.0.0.2, time, Se 3/0

C 40.0.0.0/8 is directly connected, Se 2/0

C 50.0.0.0/8 is directly connected, Se 3/0

(Similar for other Router)

In Hostap CL1

From PC1

Ping 20.0.0.2

request Timed out.

Reply from 20.0.0.2 : byte 32, time 21ms, TTL=128

..

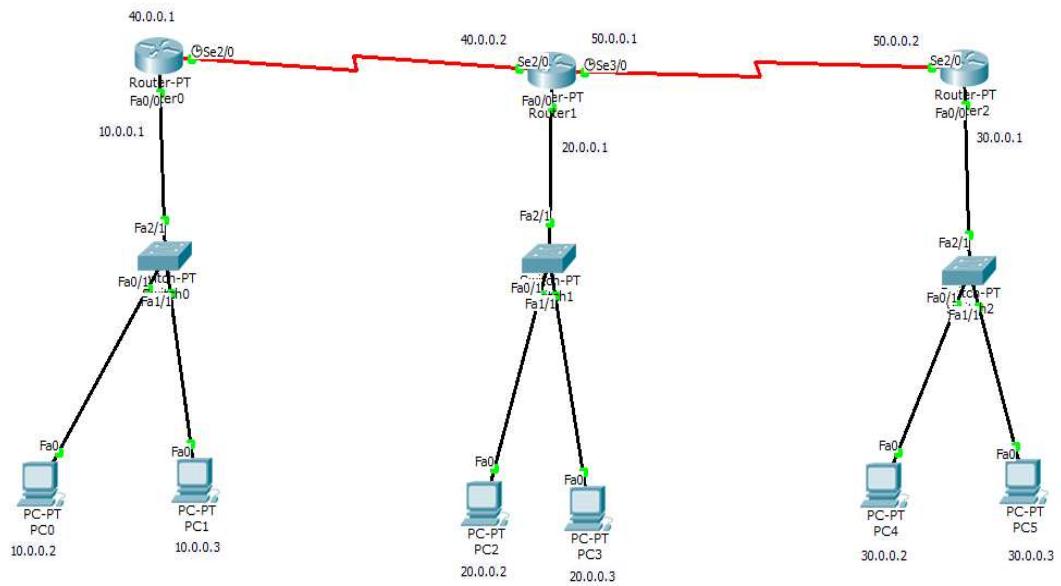
..

Ping statistics (similar for others)

Observation :

We observe that using Router Information Protocol, we can connect multiple networks which can enable communication between systems in different networks. Routers talk & share their Router tables with each other which enables the connection.

-Once RIP is activated in Router, every router shares its routing protocol with its immediate neighbours, hence in iterations every router will know about all network that their neighbour are connected to.



```

Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

R    10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:21, Serial2/0
C    20.0.0.0/8 is directly connected, FastEthernet0/0
R    30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:09, Serial3/0
C    40.0.0.0/8 is directly connected, Serial2/0
C    50.0.0.0/8 is directly connected, Serial3/0
Router#

```

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route
```

```
Gateway of last resort is not set
```

```
*   10.0.0.0/8 is directly connected, FastEthernet0/0
l  20.0.0.0/8 [120/1] via 40.0.0.2, 00:00:12, Serial2/0
l  30.0.0.0/8 [120/2] via 40.0.0.2, 00:00:12, Serial2/0
*   40.0.0.0/8 is directly connected, Serial2/0
l  50.0.0.0/8 [120/1] via 40.0.0.2, 00:00:12, Serial2/0
-----
```

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route
```

```
Gateway of last resort is not set
```

```
R  10.0.0.0/8 [120/2] via 50.0.0.1, 00:00:11, Serial2/0
R  20.0.0.0/8 [120/1] via 50.0.0.1, 00:00:11, Serial2/0
C  30.0.0.0/8 is directly connected, FastEthernet0/0
R  40.0.0.0/8 [120/1] via 50.0.0.1, 00:00:11, Serial2/0
C  50.0.0.0/8 is directly connected, Serial2/0
-----
```

PC1

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=21ms TTL=126
Reply from 20.0.0.2: bytes=32 time=2ms TTL=126
Reply from 20.0.0.2: bytes=32 time=2ms TTL=126

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 21ms, Average = 8ms

PC>ping 30.0.0.2

Pinging 30.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.2: bytes=32 time=8ms TTL=125
Reply from 30.0.0.2: bytes=32 time=7ms TTL=125
Reply from 30.0.0.2: bytes=32 time=6ms TTL=125

Ping statistics for 30.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 6ms, Maximum = 8ms, Average = 7ms

PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC2

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=8ms TTL=126
Reply from 10.0.0.2: bytes=32 time=3ms TTL=126
Reply from 10.0.0.2: bytes=32 time=5ms TTL=126
Reply from 10.0.0.2: bytes=32 time=3ms TTL=126

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 8ms, Average = 4ms

PC>ping 30.0.0.2

Pinging 30.0.0.2 with 32 bytes of data:

Reply from 30.0.0.2: bytes=32 time=5ms TTL=126
Reply from 30.0.0.2: bytes=32 time=4ms TTL=126
Reply from 30.0.0.2: bytes=32 time=6ms TTL=126
Reply from 30.0.0.2: bytes=32 time=4ms TTL=126

Ping statistics for 30.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 6ms, Average = 4ms

PC>
```

PC4

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.3

Pinging 20.0.0.3 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.3: bytes=32 time=4ms TTL=126
Reply from 20.0.0.3: bytes=32 time=6ms TTL=126
Reply from 20.0.0.3: bytes=32 time=1ms TTL=126

Ping statistics for 20.0.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 6ms, Average = 3ms

PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

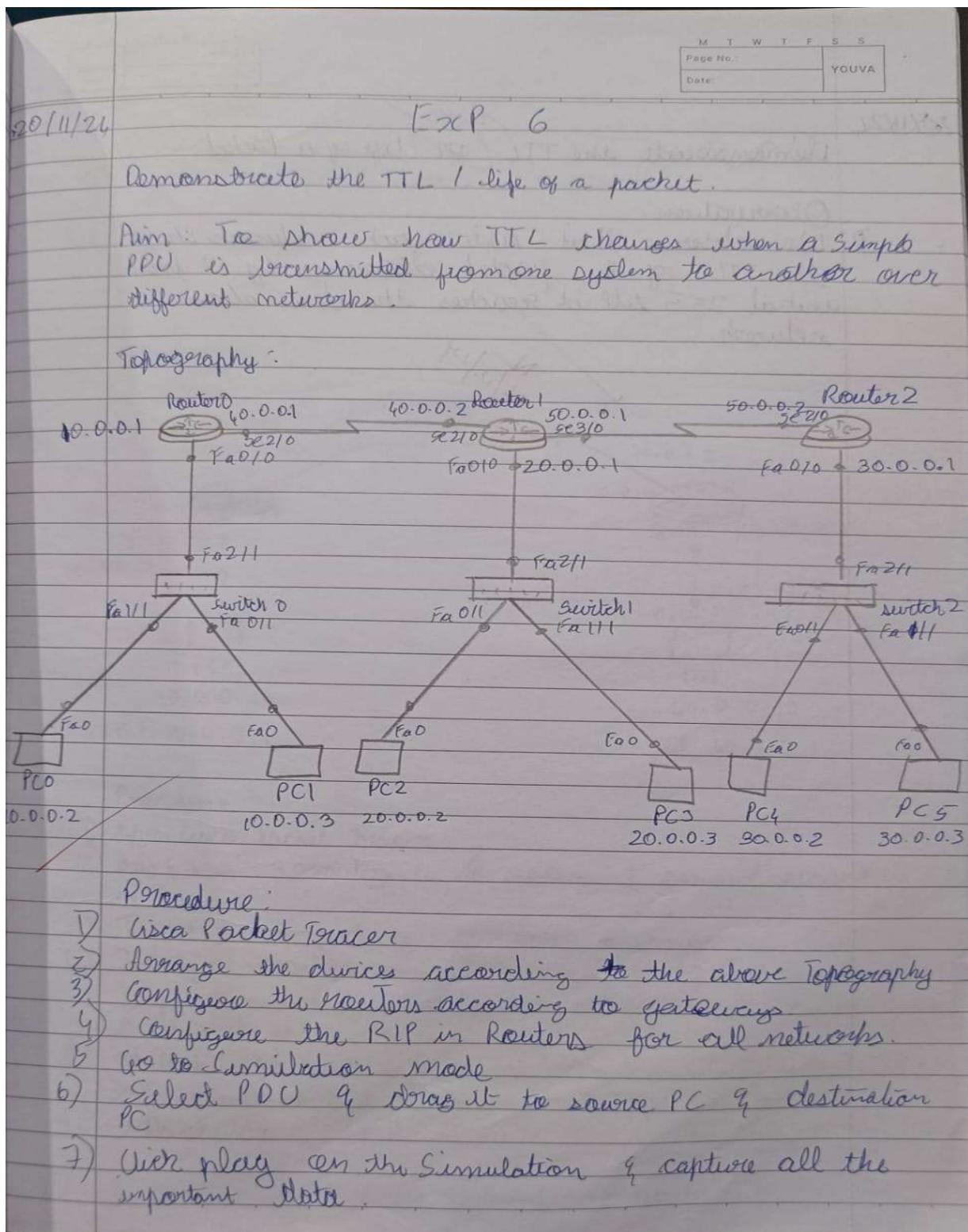
Reply from 10.0.0.3: bytes=32 time=7ms TTL=125
Reply from 10.0.0.3: bytes=32 time=10ms TTL=125
Reply from 10.0.0.3: bytes=32 time=8ms TTL=125
Reply from 10.0.0.3: bytes=32 time=6ms TTL=125

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 10ms, Average = 7ms

PC>
```

LABORATORY PROGRAM – 6

Demonstrate the TTL / life of a Packet.



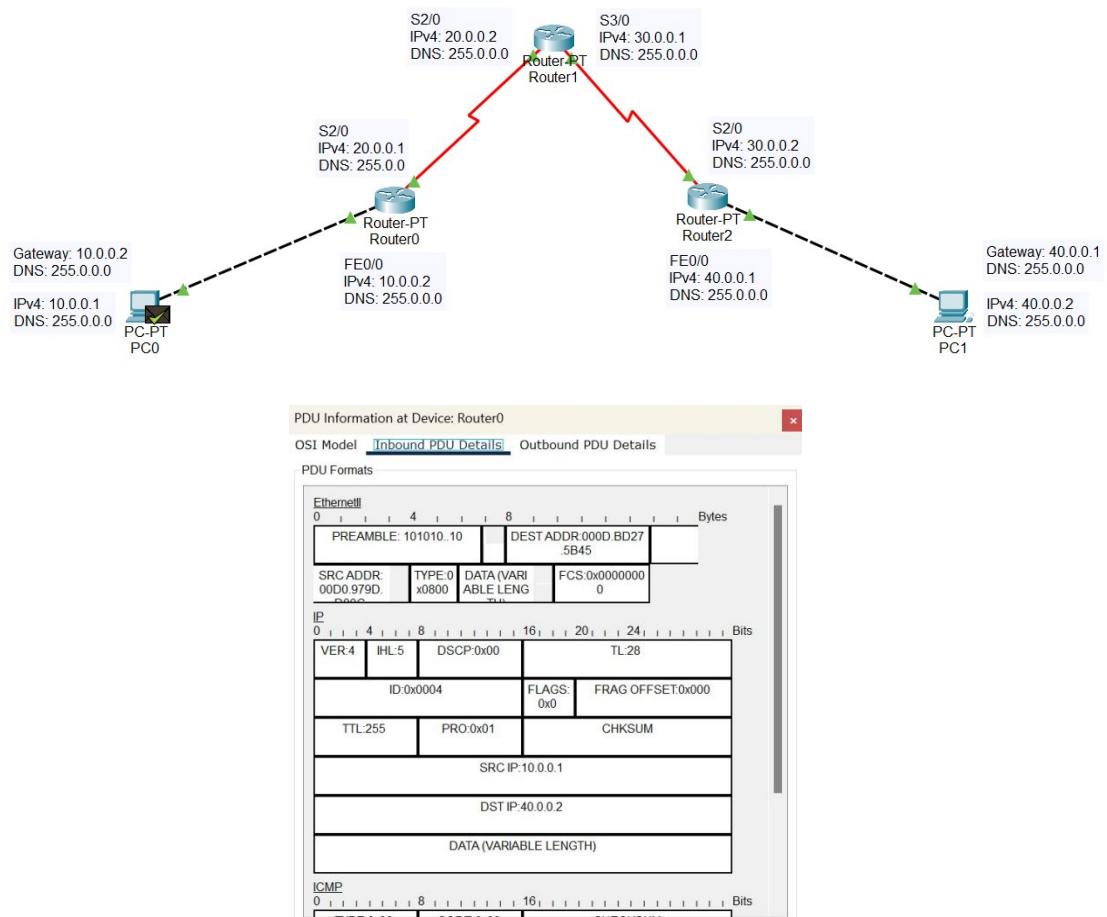
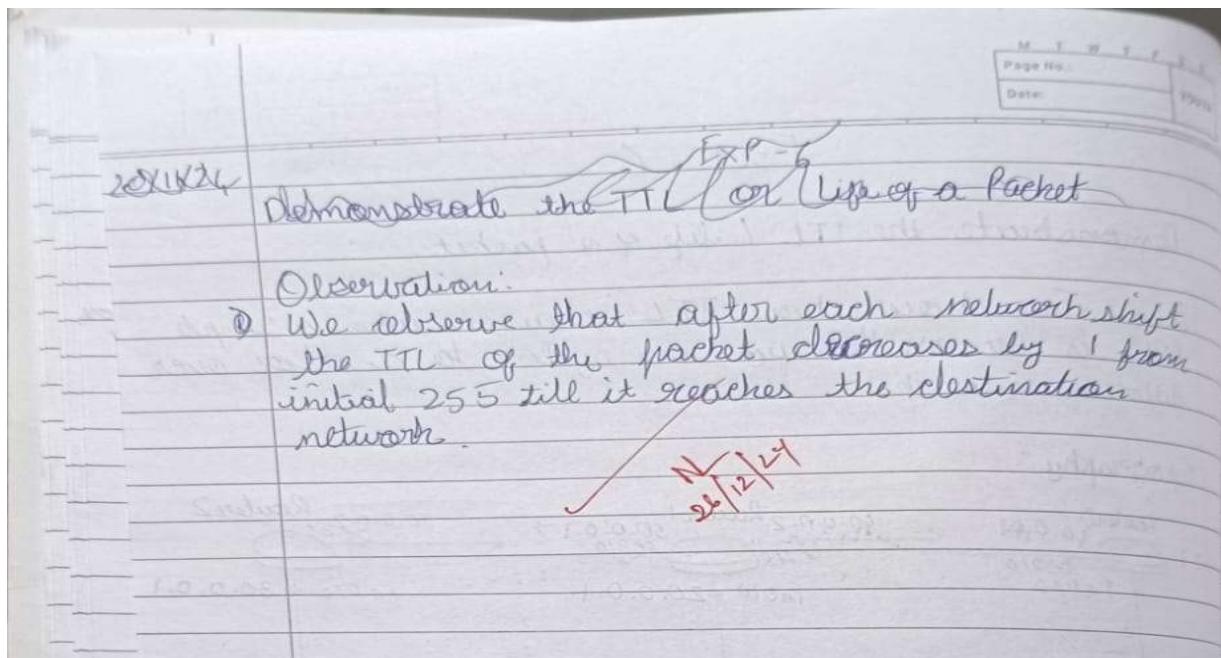


Figure 6.1: Inbound PDU, Router0

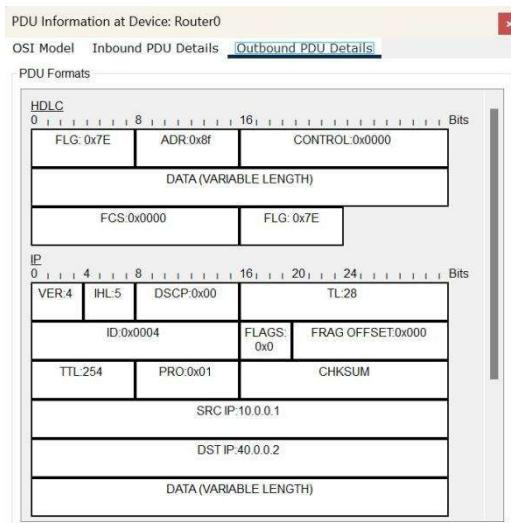


Figure 6.2: Outbound PDU, Router0

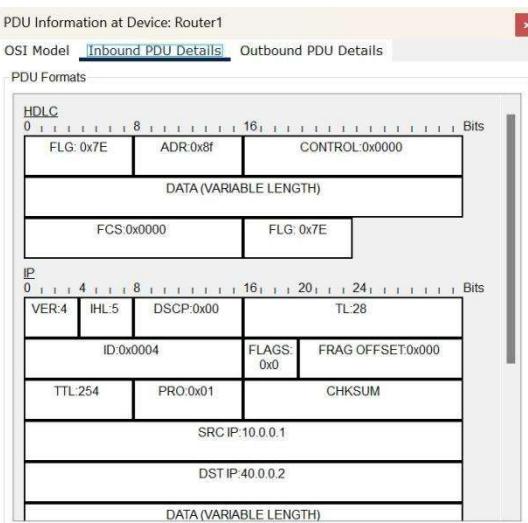


Figure 6.3: Inbound PDU, Router1

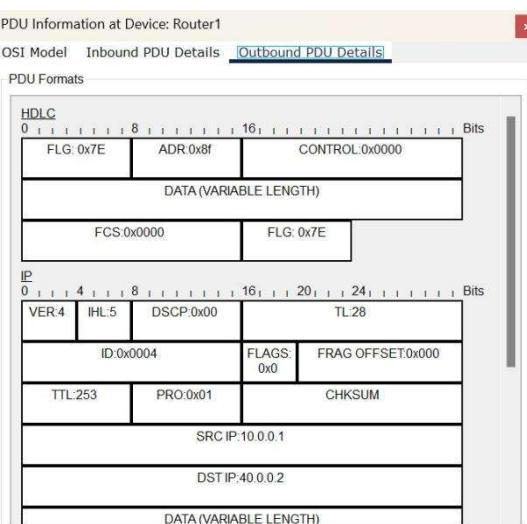


Figure 6.4: Outbound PDU, Router1

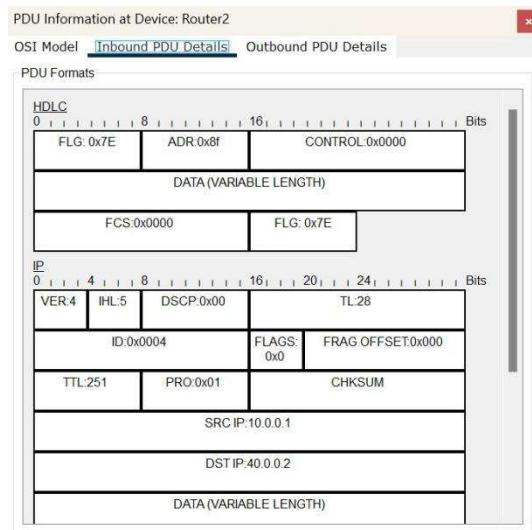


Figure 6.5: Inbound PDU, Router2

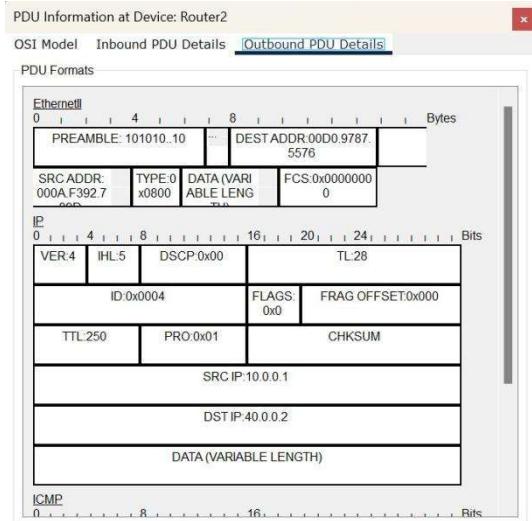


Figure 6.6: Outbound PDU, Router2

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit (edit)	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	Edit (edit)	Delete

```
c:\>ping 40.0.0.2

Pinging 40.0.0.2 with 32 bytes of data:

Reply from 40.0.0.2: bytes=32 time=72ms TTL=123
Reply from 40.0.0.2: bytes=32 time=53ms TTL=123
Reply from 40.0.0.2: bytes=32 time=55ms TTL=123
Reply from 40.0.0.2: bytes=32 time=69ms TTL=123

Ping statistics for 40.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 53ms, Maximum = 72ms, Average = 62ms
```

LABORATORY PROGRAM – 7

Configure OSPF routing protocol

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Q) Configure OSPF routing Protocol

Aim:

Topology:

Procedure

- 1) Open Cisco Packet tracer
- 2) Drag & drop 3 routers in system & connect according to diagram
- 3) Input IP & gateway to both systems
- 4) Initialize router connections in CLI. \rightarrow Router \rightarrow Enable \rightarrow config terminal \rightarrow interface Fa0/0 or ~~Serial 0/0~~ \rightarrow IP address Subnet \rightarrow no shutdown \rightarrow exit
- 5) While doing for router to router \rightarrow config terminal \rightarrow interface ~~Serial 2/0~~ \rightarrow IP address Subnet \rightarrow encapsulation ppp \rightarrow clock rate 64000 \rightarrow no shutdown \rightarrow exit
only for connection with clock symbol.
- 6) In the same cli \rightarrow config terminal \rightarrow router OSPF 1 \rightarrow

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router-id 1.1.1.1 (2 & 3 for router 2 & 3) →
 network 10.0.0.0 0.255.255.255 area 3 →
 network 20.0.0.0 0.255.255.255 area 1 →
 exit
 (for both all routers w.r.t areas mentioned)

7) In cli → config terminal → interface loopback 0 →
 ip add 172.16.1.252 (253 & 254 for 2 & 3) 255.255.0.0 →
 no shutdown

8) In cli → config terminal → router ospf 1 →
 area 1 virtual-link 2.2.2.2 → ext (RID)
 (R2)
 area 1 virtual-link 1.1.1.1 → exit

9) Show IP route

10) Ping from one system to other

Result

Show IP Route.

R1

C 10.0.0.0/8 is directly connected, Fo 0/0

90.0.0.0/8 is variably subnetted, 2 subnets, 2 routes

C 20.0.0.0/8 is directly connected, SE 2/0

C 20.0.0.2/32 is ...

O 30.0.0.0/8 [110/128] via 20.0.0.2, 00:08:05.420

O 40.0.0.0/8 [10/129] via 20.0.0.2, 00:08:05.420

C 172.16.0.0/16 is directly connected, loopback0

Similar for other routers

M	T	W	T	F	S	S
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In destin. Cmd.

Ping 40.0.0.10

pinging 40.0.0.10 with 32 bytes of data:

Request timed out.

Reply from 40.0.0.10: bytes=32 time=5ms TTL=125

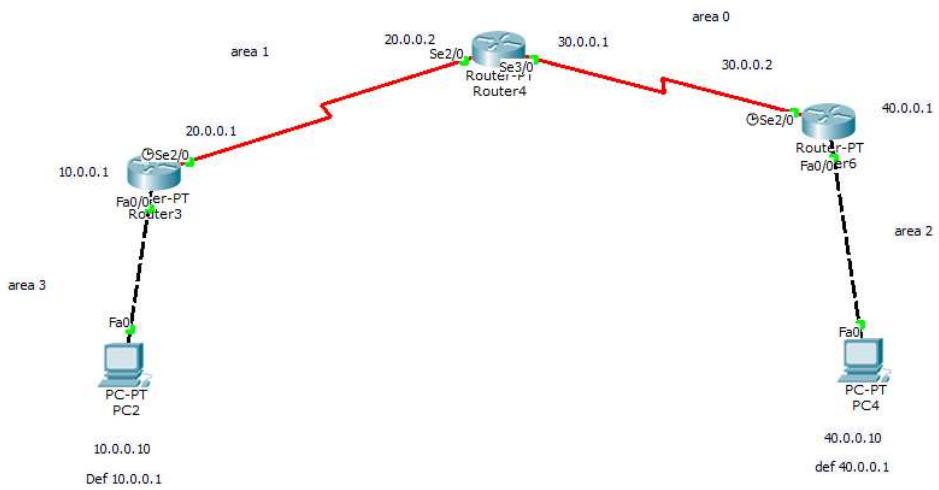
" "

" "

Ping statistics.

Observation:

We observe how OSPF is configured & operates in a network. Key observations include establishment of neighbour relationships between routers, the exchange of link-state advertisements, & the formation of a routing table based on the shortest path determined using Dijkstra's algorithm. It demonstrates the dynamic nature of OSPF, allowing routers to adapt to network changes & ensuring efficient & loop-free routing in an IP network. Additionally, we can monitor how OSPF areas, authentication & metric calculations influence the routing process.



R1

```

Router>enable
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C   10.0.0.0/8 is directly connected, FastEthernet0/0
    20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C     20.0.0.0/8 is directly connected, Serial2/0
C     20.0.0.2/32 is directly connected, Serial2/0
O   30.0.0.0/8 [110/128] via 20.0.0.2, 00:08:05, Serial2/0
O   40.0.0.0/8 [110/129] via 20.0.0.2, 00:08:05, Serial2/0
C   172.16.0.0/16 is directly connected, Loopback0
  
```

R2

```

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/65] via 20.0.0.1, 00:08:32, Serial2/0
  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C     20.0.0.0/8 is directly connected, Serial2/0
C     20.0.0.1/32 is directly connected, Serial2/0
  30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C     30.0.0.0/8 is directly connected, Serial3/0
C     30.0.0.2/32 is directly connected, Serial3/0
O     40.0.0.0/8 [110/65] via 30.0.0.2, 00:33:02, Serial3/0
C     172.16.0.0/16 is directly connected, Loopback0
Router#
```

R3

```

Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:01:53, Serial2/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:26:12, Serial2/0
  30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C     30.0.0.0/8 is directly connected, Serial2/0
C     30.0.0.1/32 is directly connected, Serial2/0
C     40.0.0.0/8 is directly connected, FastEthernet0/0
C     172.16.0.0/16 is directly connected, Loopback0
Router#
```

Ping OP

```
PC>ping 40.0.0.10

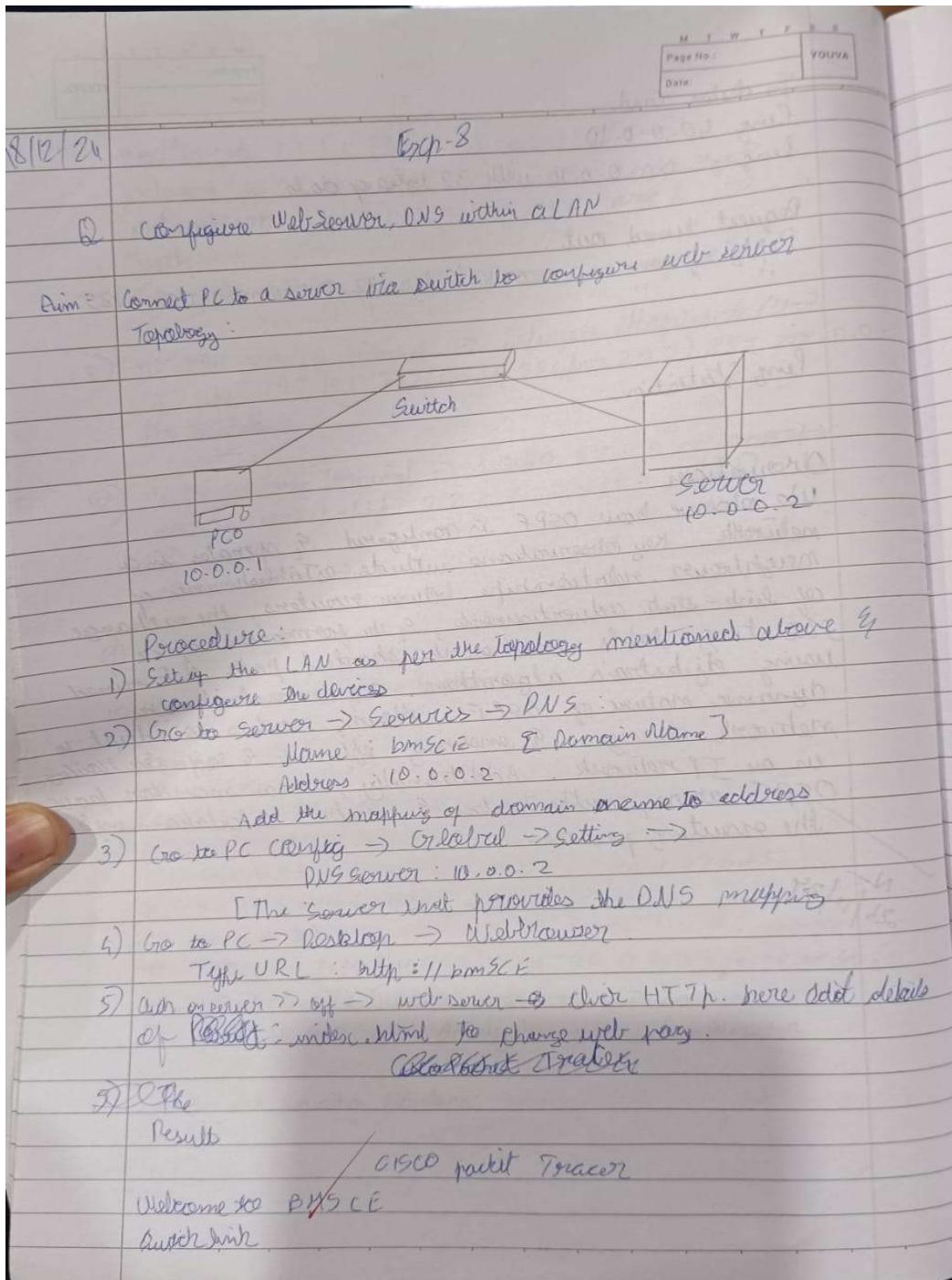
Pinging 40.0.0.10 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.10: bytes=32 time=9ms TTL=125
Reply from 40.0.0.10: bytes=32 time=6ms TTL=125
Reply from 40.0.0.10: bytes=32 time=6ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 9ms, Average = 7ms
```

LABORATORY PROGRAM – 8

Configure Web Server, DNS within a LAN.

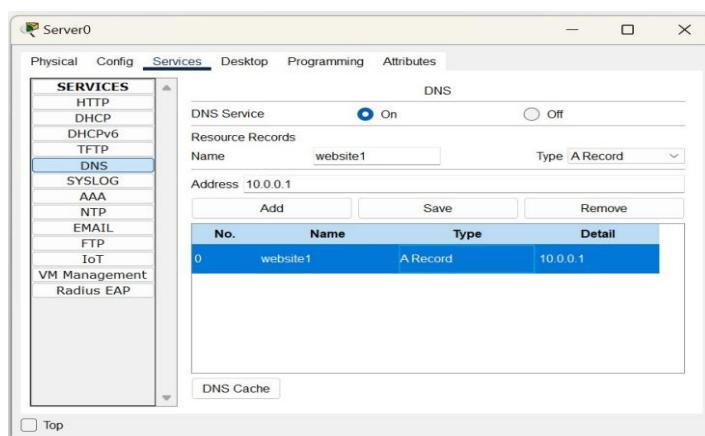
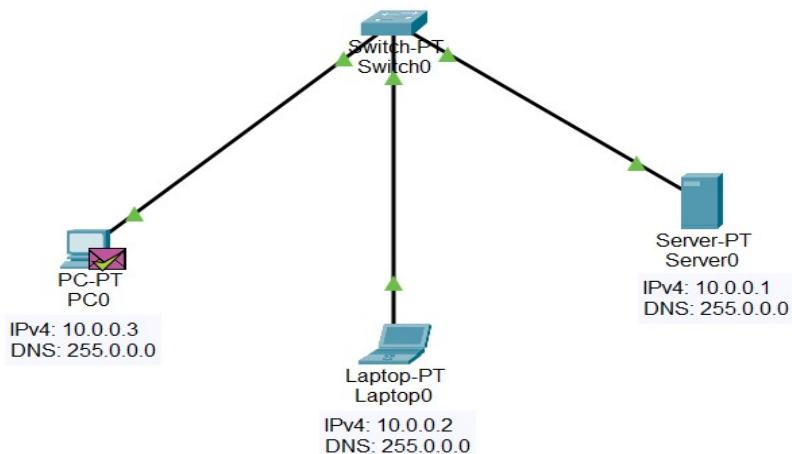


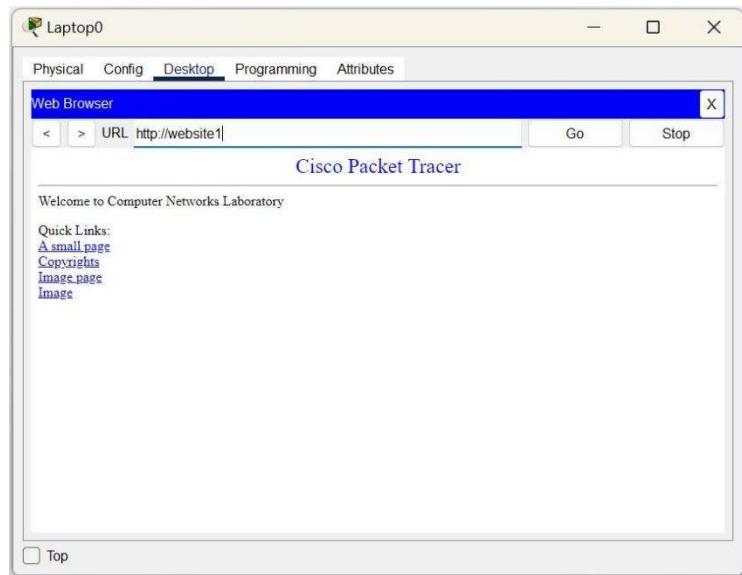
A small page
Copy right
unique page
image -

Observation.

- 1] The web pages hosted by the server were visible on the browser
- 2] The DNS was successful in mapping the domain name to the IP address
- 3] DNS server is a server that contains a domain name IP address, mapping to which the end devices send requests to map the name to IP address
- 4] index.html can be edited to our personalized website details to be displayed.

✓
28/12/2024





LABORATORY PROGRAM – 9

To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)

M T W T F S S
Page No. _____ Date _____ YOUVA

(3) 12/11 Lab - 9

Q To construct simple LAN & understand the concept and operation of Address Resolution Protocol

Aim: To understand the concept & operation of ARP

Topology :

Procedure

- 1) Open Cisco Packet Tracer.
- 2) Set up the devices as shown in the Figure.
- 3) Configure the IP addresses for the devices as shown.
- 4) Switch to Simulation mode.
- 5) Direct a simple PDU from a destination to source.
- 6) Start the simulation & observe.
- 7) Take Inspect tool & open ARP tables for all devices.

Result

In Switch CLI

> Show mac address-table

MAC Address Table			
VLAN	MAC Address	Type	Ports
1	0001.4215.1e08	Dynamic	Fa 3/1
1	0001.43ec.2ad3		Fa 2/1
1	0002.4639.23c2		1/1
1	00d0.235b.384b		0/1

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Initially ARP tables Empty

After Simulation begins the ARP Tables of the Source & Destination change

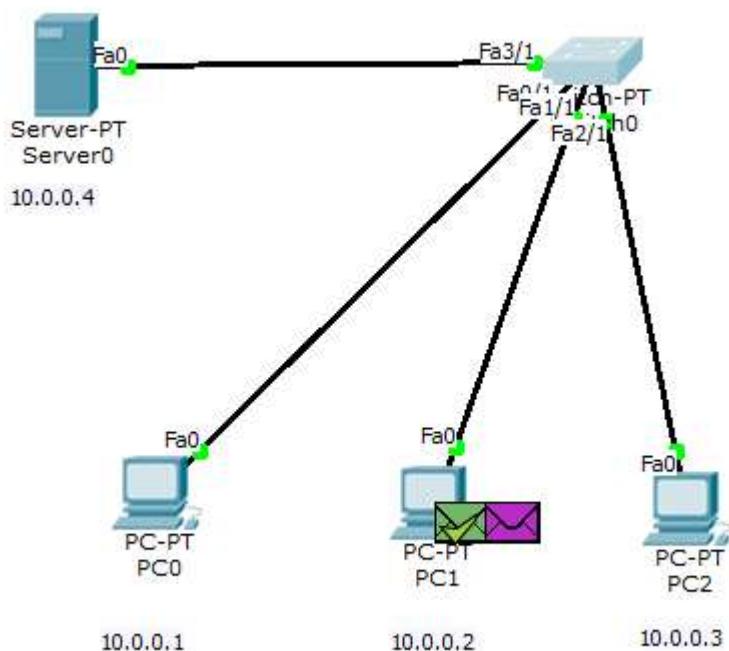
PC1	IP	Hardware	Interface
	10.0.0.3	0001.63cc.2ad3	FAC)

PC2	IP	Hardware	Interface
	10.0.0.2	0002.6a35.03c2	FAC)

Observation :

Initially, the ARP tables of all the devices are empty because no communication has occurred, and no Mac-IP mapping is cached. When one device attempts to communicate with another, it sends an ARP request to determine the MAC address corresponding to the IP address of the target device. The target device responds with an ARP reply, updating ARP table on both ends. The switch builds its MAC address table by mapping MAC addresses to ports based on receiving frames. Subsequent communication uses cached ARP entries, avoiding repeated requests.

28/12/27



Switch0

Physical Config CLI

IOS Command Line Interface

```

%LINK-5-CHANGED: Interface fastethernet1/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet2/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up

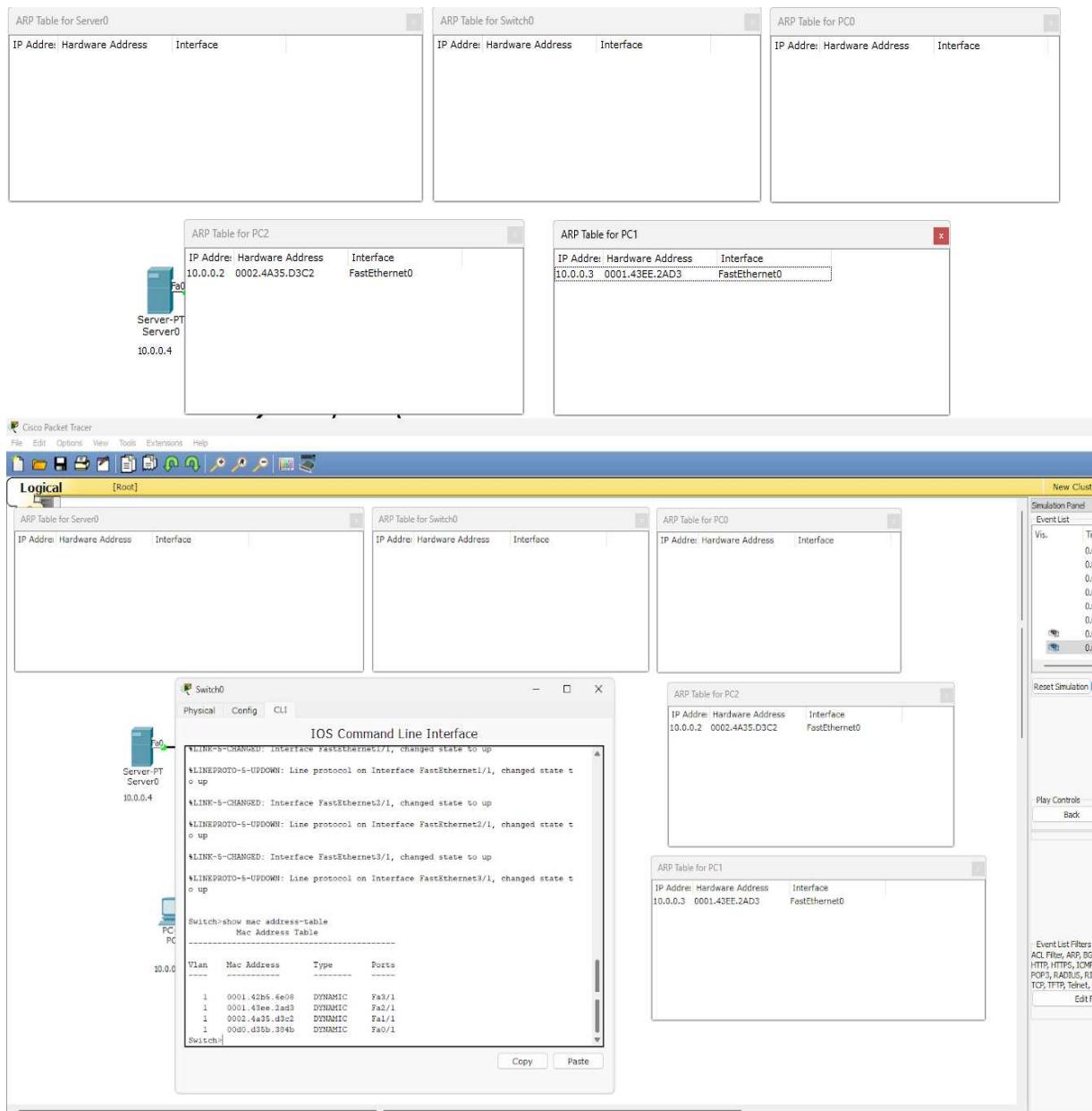
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>show mac address-table
      Mac Address Table
-----
  Vlan      Mac Address          Type      Ports
  ----      -----              -----     -----
    1        0001.42b5.6e08    DYNAMIC   Fa3/1
    1        0001.43ee.2ad3    DYNAMIC   Fa2/1
    1        0002.4a35.d3c2    DYNAMIC   Fa1/1
    1        00d0.d35b.384b    DYNAMIC   Fa0/1

```

Switch>

Copy Paste



LABORATORY PROGRAM – 10

To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

18/10/24 EXP - 10

Q) To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

Aim: To understand the op of TELNET protocol & its usage for remote access

Topology:

```
graph TD; Router((Router)) --- Fa0/0[Fa 0/0]; Fa0/0 --- PC0[PC0]; Router --- IP1[10.0.0.2]; PC0 --- IP2[10.0.0.1]
```

Procedure

- 1) Open Cisco Packet Tracer
- 2) Set up the devices as shown in figure
- 3) Assign IP address to PC's
- 4) Set up the Router in CLI, open CLI.
Enter Enable → config Terminal → hostname R1 →
enable secret <password> → interface Fa0/0 →
IP address 10.0.0.2 255.0.0.0 → no shutdown →
link vty 0 3 → login → password <password> →
exit → end → wr [commit]
↳ to save changes in Router
- 5) Go to CMD in PC0 & ping 10.0.0.2
- 6) After 1st ping result type Telnet 10.0.0.2
→

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Results

[Ping]

Pinging 10.0.0.2 with 32 bytes of data.

Reply from 10.0.0.2 bytes=32 time=0ms TTL=255

Line Statistics

[Telnet]

Pinging 10.0.0.2 ... open

User Access Verification

<Enter Password 1>

R1> enable

~~R1#show ip route~~

Password: < Password 2 >

R1# show IP route

Codes: ..

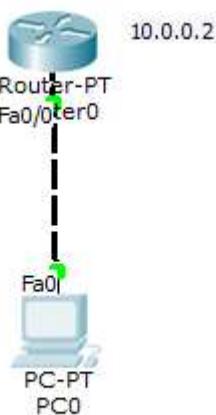
Gateway of last resort is not set.

C 10.0.0.0/8 is directly connected, Fa 0/0

~~Observation:~~

Telnet is a text based protocol that enables remote communication over TCP/IP networks. It allows the execution of commands on a remote device, often used for initial setup or management. In the experiment above, we see that all configurations were commands executed via Telnet mirrored those done directly on the router but from the PC interface instead.

Only disadvantage is that Telnet lacks on encryption, making it less secure compared to SSH.



```

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#enable secret black@121
R1(config)#interface fa0/0
R1(config-if)#ip address 10.0.0.2 255.0.0.0
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

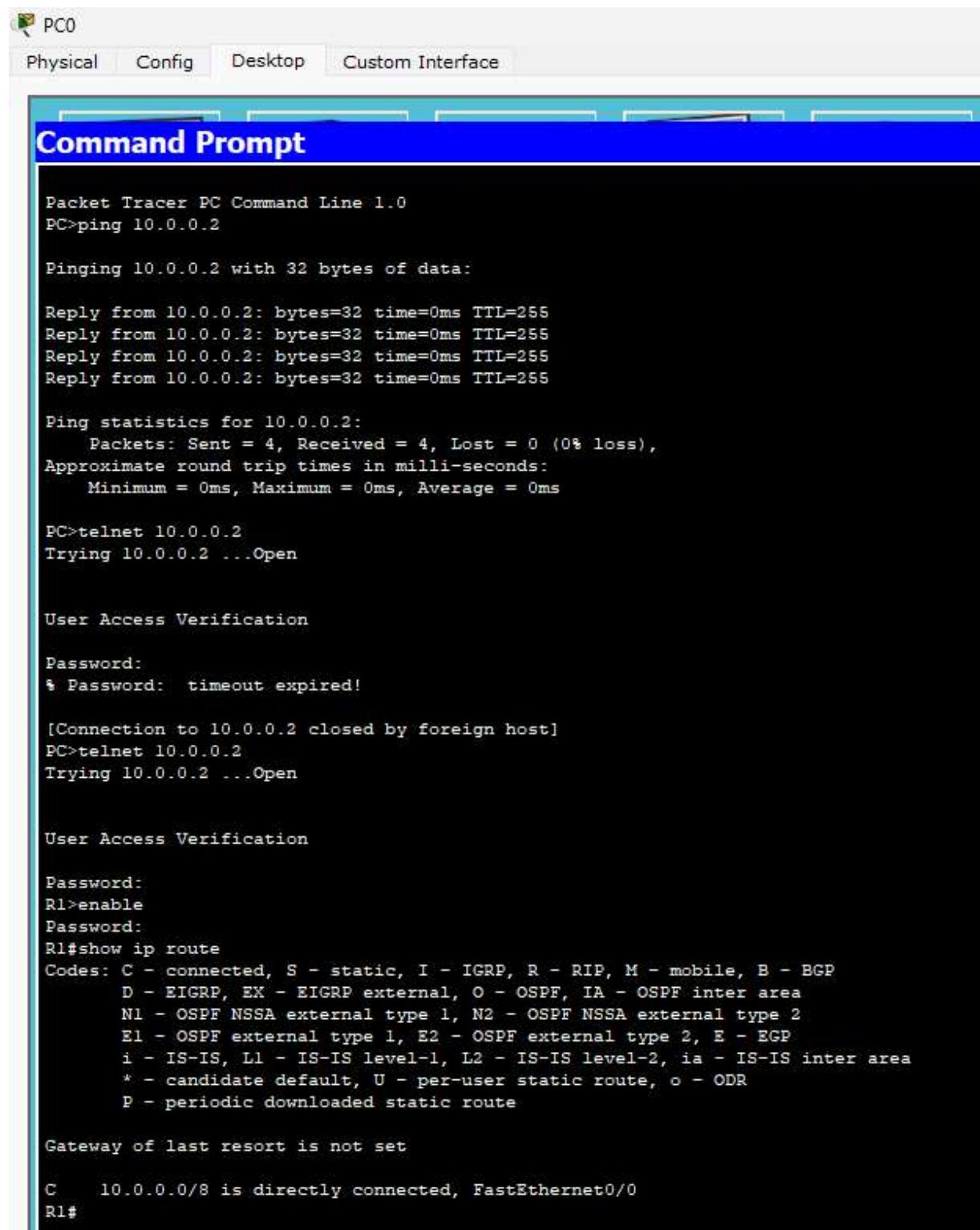
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R1(config-if)#line vty 0 3
R1(config-line)#login
% Login disabled on line 132, until 'password' is set
% Login disabled on line 133, until 'password' is set
% Login disabled on line 134, until 'password' is set
% Login disabled on line 135, until 'password' is set
R1(config-line)#password black@12
R1(config-line)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#wr
Building configuration...
[OK]
R1#

```

OP:



PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=0ms TTL=255

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>telnet 10.0.0.2
Trying 10.0.0.2 ...Open

User Access Verification

Password:
* Password: timeout expired!

[Connection to 10.0.0.2 closed by foreign host]
PC>telnet 10.0.0.2
Trying 10.0.0.2 ...Open

User Access Verification

Password:
R1>enable
Password:
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
R1#
```

LABORATORY PROGRAM – 11

To construct a VLAN and make the PC's communicate among a VLAN

Page No.	YOUVA
Date:	

18/12/24 Exp - 11

Q: To construct a VLAN & make the PC's communicate among a VLAN.

Aim: To construct a VLAN & understand its function.

Topology:

Procedure

- 1) Open Cisco packet Tower
- 2) Set up the connections between the devices as shown (choose 1841)
- 3) Set IP & gateway addresses to all PC's
- 4) Set up router for one gateway
enable → config Terminal → interface fa0/0 → IP address 192.168.1.1 255.255.255.0 → no shutdown → exit
- 5) Go to Switch Config → select VLAN database
Create a new VLAN (VLAN number 2, VLAN name: CSRISE), add
- 6) Go to ~~the~~ interface ethernet 6/1 → switch to trunk
- 7) Go to Fa2/1 Access & VLAN (Enter VLAN number)
- 8) Go to Router CLI

→

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- 9) Plan database \rightarrow VLAN 2 name cocaine \rightarrow exit.
- 10) Config terminal \rightarrow interface $\text{FastEthernet} 0/0.1 \rightarrow$ encapsulation dot1q 2 \rightarrow ip address 192.168.2.1
255.255.255.0 \rightarrow no shutdown \rightarrow exit \rightarrow exit
- 11) ~~Run Database~~ Enter Show IP Route
- 12) Ping from one device to the other

Result

Show ip route

C 192.168.1.0/24 is directly connected, Fa0/0
C 192.168.2.0/24 , Fa0/0.1

PC0

Ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Request timed out

Reply from 192.168.2.2 bytes=32, time=2ms TTL=127

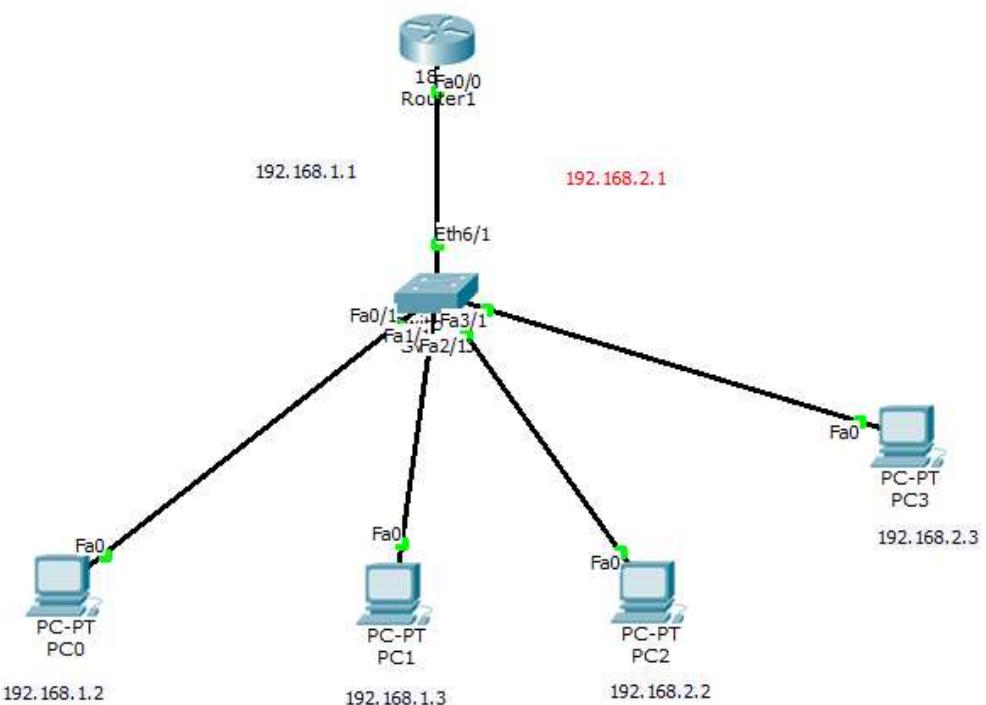
Ping statistics

Same for other devices

Observation :

The VLAN experiment involves creating and configuring VLANs to segment a network, assigning IPs to devices for seamless intra-VLAN communications & using dot1q encapsulation for inter-VLAN connectivity to communicate through a single trunk link. This experiment highlights the importance of VLANs in optimizing & managing modern networks effectively.

20/12/24



```

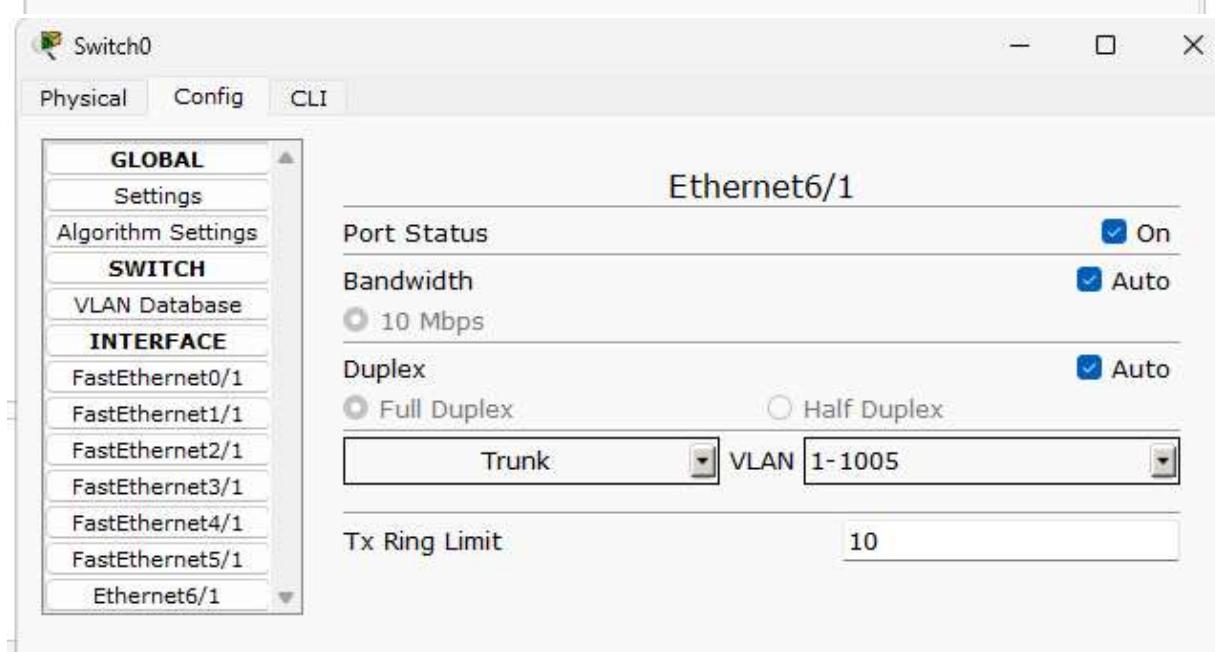
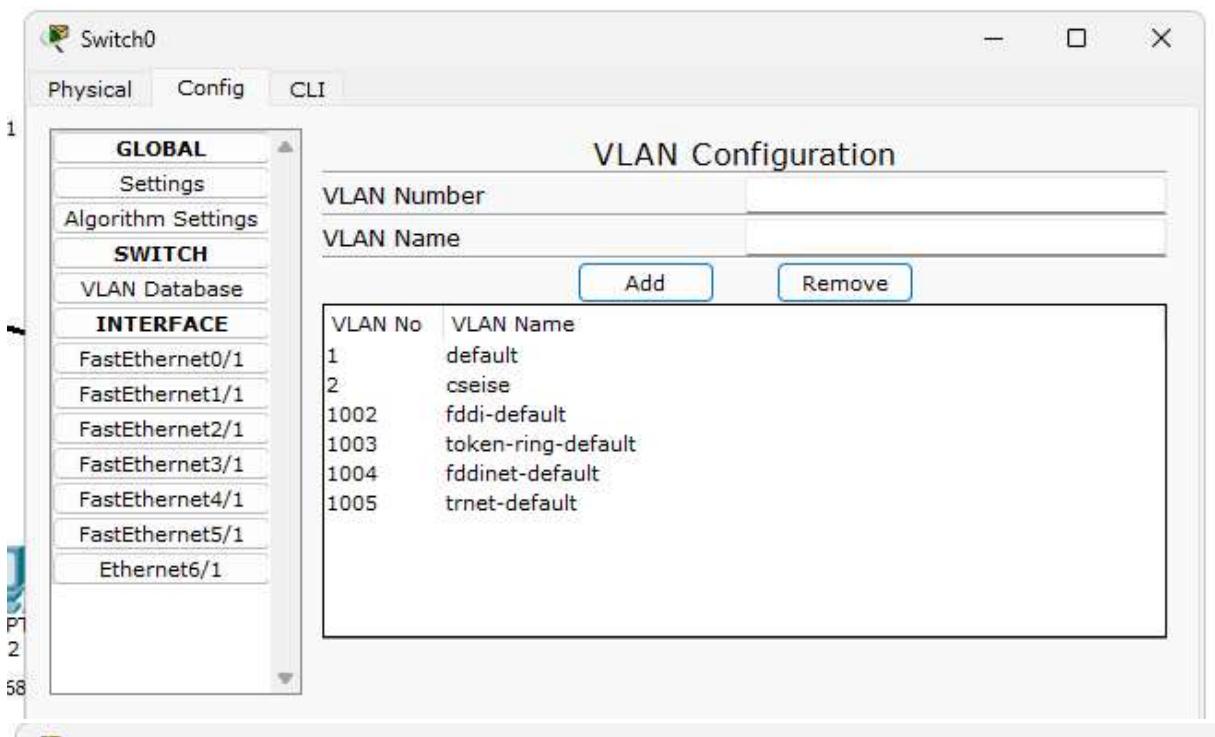
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
*LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
o up

Router(config-if)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console

```



Equivalent IOS Commands

```
Switch>enable  
Switch#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
Switch(config)#  
Switch(config)#interface Ethernet6/1  
Switch(config-if)#
```

Switch0

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

SWITCH

VLAN Database

INTERFACE

FastEthernet0/1

FastEthernet1/1

FastEthernet2/1

FastEthernet3/1

FastEthernet4/1

FastEthernet5/1

Ethernet6/1

FastEthernet2/1

Port Status On

Bandwidth Auto

10 Mbps 100 Mbps

Duplex Auto

Full Duplex Half Duplex

Access VLAN 2

Tx Ring Limit 10

Equivalent IOS Commands

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#interface Ethernet6/1
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet2/1
Switch(config-if)#

```

Router1

Physical Config CLI

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/0

FastEthernet0/1

VLAN Configuration

VLAN Number

VLAN Name

Add Remove

VLAN No	VLAN Name
1	default
2	cseise
1002	fdi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

Equivalent IOS Commands

* Warning: It is recommended to configure VLAN from config mode, as VLAN database mode is being deprecated. Please consult user documentation for configuring VTP/VLAN in config mode.

```

Router#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

Router(vlan)#vlan 2 name cseise
VLAN 2 modified:
  Name: cseise
Router(vlan)#
Router(vlan)#exit
APPLY completed.
Exiting...
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0.1
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state
to up

Router(config-subif)#encapsulation dot1q 2
Router(config-subif)#ip address 192.168.2.1 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

Router(vlan)#
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0.1
Router#

```

PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.2.2: bytes=32 time=2ms TTL=127
Reply from 192.168.2.2: bytes=32 time=1ms TTL=127
Reply from 192.168.2.2: bytes=32 time=5ms TTL=127

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 5ms, Average = 2ms

PC>
```

PC3

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.3

Pinging 192.168.1.3 with 32 bytes of data:

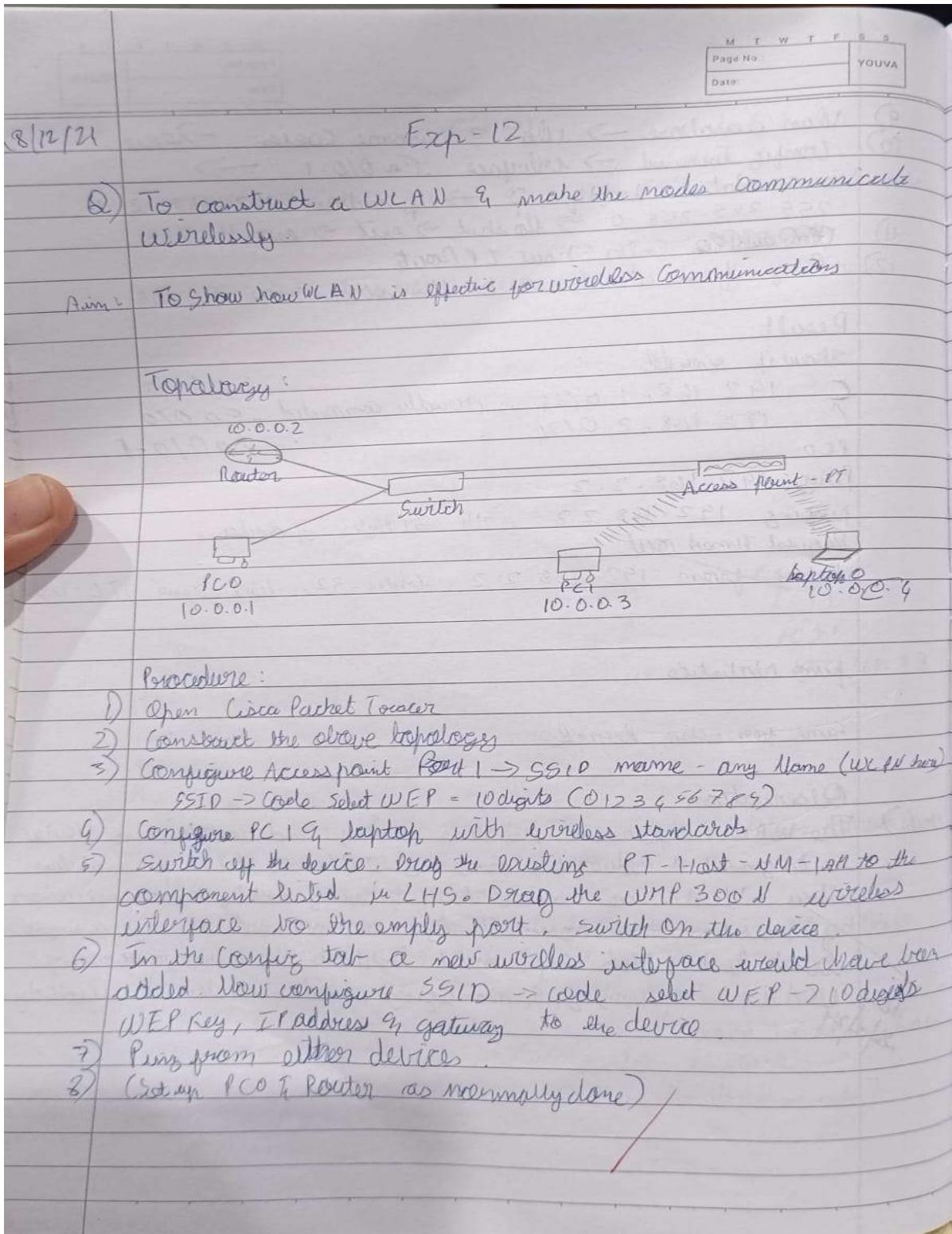
Request timed out.
Reply from 192.168.1.3: bytes=32 time=0ms TTL=127
Reply from 192.168.1.3: bytes=32 time=0ms TTL=127
Reply from 192.168.1.3: bytes=32 time=0ms TTL=127

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>
```

LABORATORY PROGRAM – 12

To construct a WLAN and make the nodes communicate wirelessly



S	F	M	T	W	T	F	S
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Date							

Result

PCD

ping 10.0.0.3

pinging 10.0.0.3 path 32 bytes of data:
Reply from 10.0.0.3: bytes = 32, time = 19 ms TTL = 128

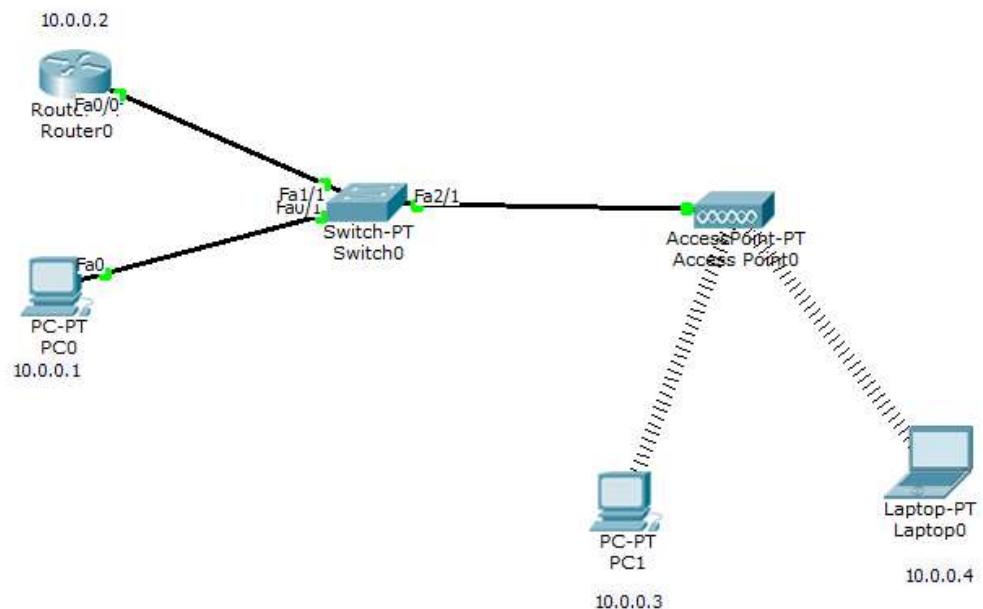
Ping Statistics

Some further device

Observation :

The experiment demonstrates the creation of a wireless network using an access point configured with an SSID, WEP encryption & a 10 digit key. Devices like PC's & laptops were configured with wireless adapters, IP addresses & gateways to enable communication. The success of ping tests by few devices verify the setup, highlighting the simplicity & efficiency of WLAN connections for wireless communication.

✓ ✓ ✓ ✓



```

--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shut

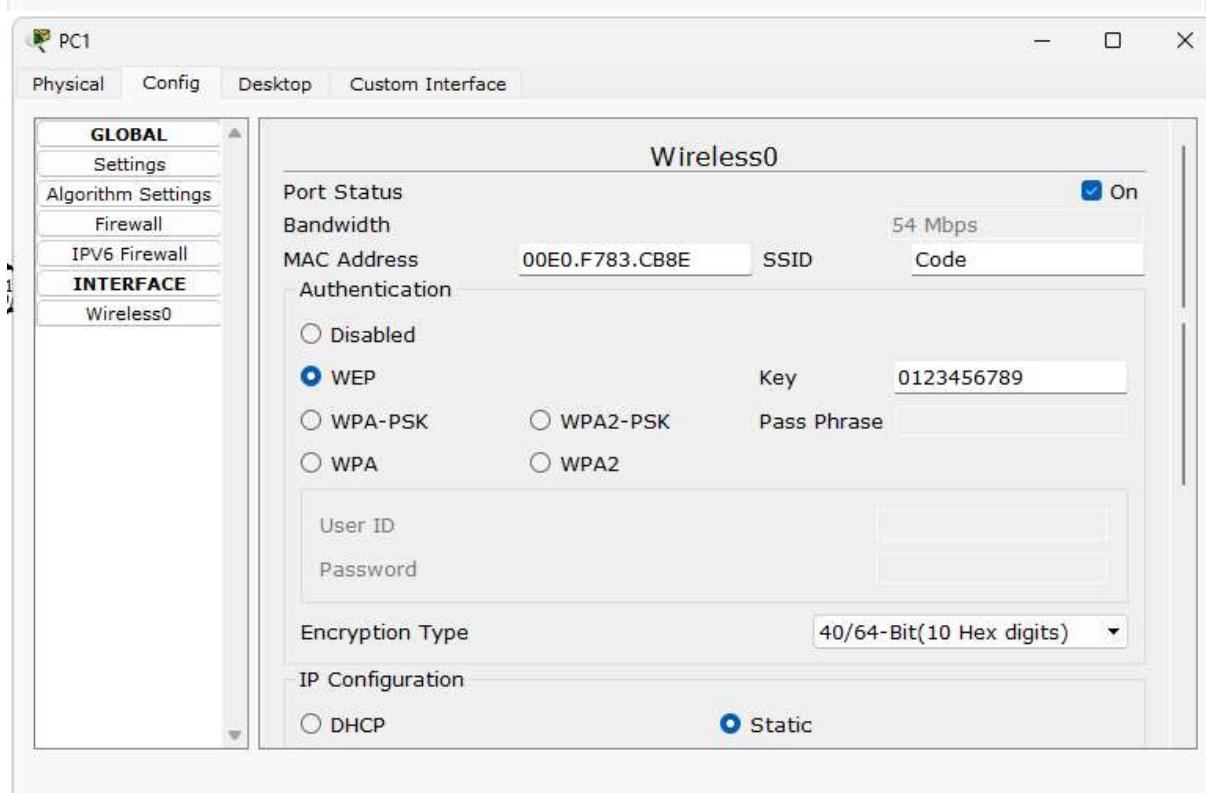
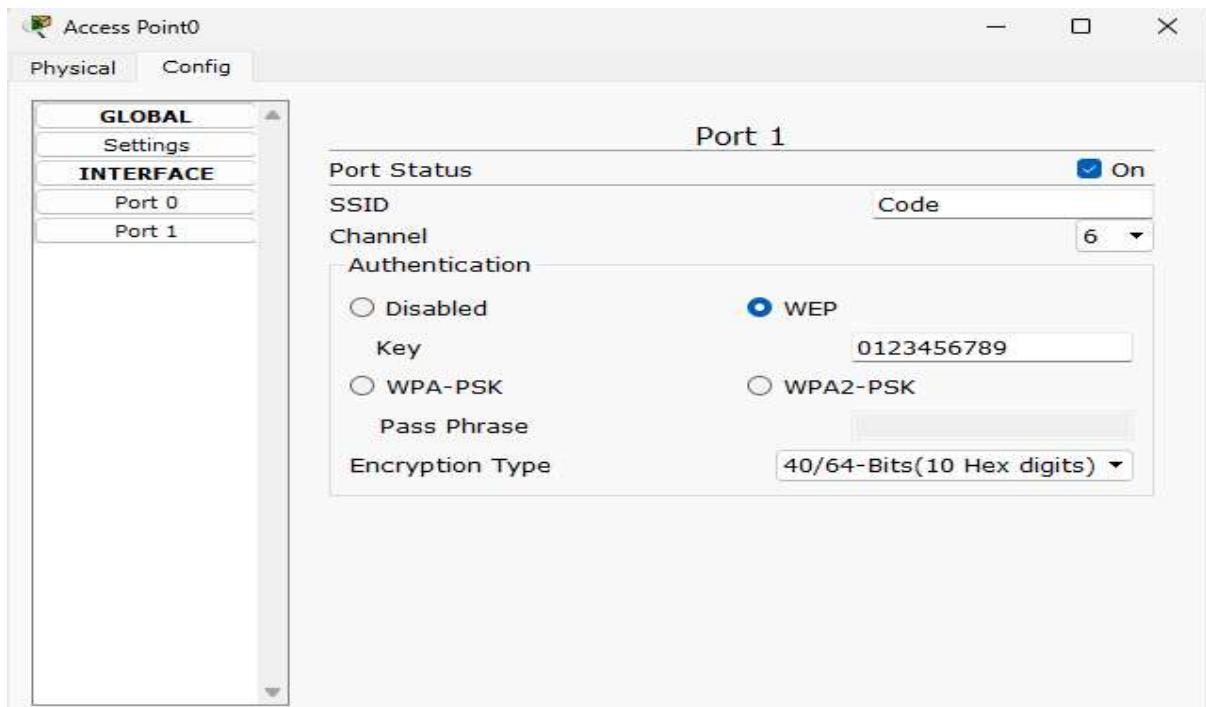
Router(config-if)#
*LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
o up

Router(config-if)#exit
Router(config)#

```





Laptop0

Physical Config Desktop Custom Interface

GLOBAL

- Settings
- Algorithm Settings
- Firewall
- IPv6 Firewall
- INTERFACE**
- Wireless0

Wireless0

Port Status
Bandwidth 54 Mbps On

MAC Address 0090.0CC7.8CEC SSID Code

Authentication

Disabled

WEP Key 0123456789

WPA-PSK Pass Phrase

WPA WPA2

User ID
Password

Encryption Type 40/64-Bit(10 Hex digits)

IP Configuration

DHCP Static

PC1

IP Configuration

IP Configuration

DHCP Static

IP Address 10.0.0.3

Subnet Mask 255.0.0.0

Default Gateway 10.0.0.2

DNS Server

IPv6 Configuration

DHCP Auto Config Static

IPv6 Address /

Link Local Address FE80::2E0:F7FF:FE83:CB8E

IPv6 Gateway

IPv6 DNS Server

PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=19ms TTL=128
Reply from 10.0.0.3: bytes=32 time=8ms TTL=128
Reply from 10.0.0.3: bytes=32 time=6ms TTL=128
Reply from 10.0.0.3: bytes=32 time=6ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 19ms, Average = 9ms

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=20ms TTL=128
Reply from 10.0.0.4: bytes=32 time=8ms TTL=128
Reply from 10.0.0.4: bytes=32 time=6ms TTL=128
Reply from 10.0.0.4: bytes=32 time=8ms TTL=128

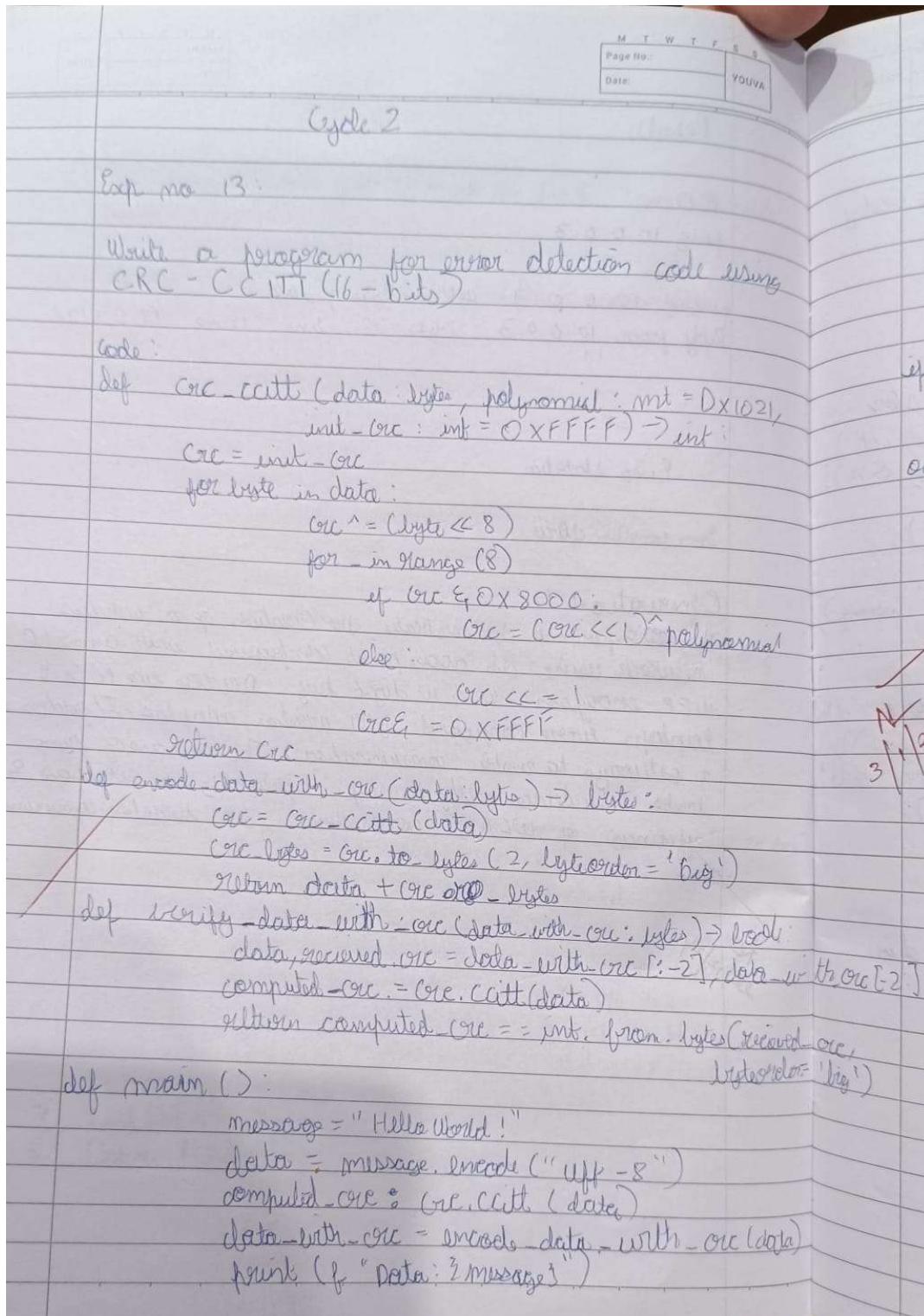
Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 20ms, Average = 10ms

PC>
```

CYCLE 2

LABORATORY PROGRAM – 13

Write a program for error detecting code using CRC-CCITT (8-bits).



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```

point("Computed CRC-CCITT : 0X83, computed-CRC
      : 04 X 3")
is_Valid = verify_data_with_CRC(data_in_hex)
if is_Valid:
    point("Data received correctly with no errors")
else:
    point("Data received with errors")
if __name__ == "__main__":
    main()

```

Output :

```

Data: Hello world
computed. CRC-CCITT : 0X882A
Data Received correctly with no errors

```

N
3/1/25

Code

```

def xor(a, b):
    result = []
    for i in range(1, len(b)):
        if a[i] == b[i]:
            result.append('0')
        else:
            result.append('1')
    return ''.join(result)

```

```

def mod2div(dividend, divisor):

```

```

pick = len(divisor)
tmp = dividend[0:pick]

while pick < len(dividend):
    if tmp[0] == '1':
        tmp = xor(divisor, tmp) + dividend[pick]
    else:
        tmp = xor('0' * pick, tmp) + dividend[pick]
    pick += 1

    if tmp[0] == '1':
        tmp = xor(divisor, tmp)
    else:
        tmp = xor('0' * pick, tmp)

checkword = tmp
return checkword

def encode(data, key):
    key_len = len(key)
    appended_data = data + '0' * (key_len - 1)
    remainder = mod2div(appended_data, key)
    codeword = data + remainder
    print(f"Encoded Data: {codeword}")
    return codeword

def decode(data, key):
    remainder = mod2div(data, key)
    print(f"Remainder after decoding: {remainder}")
    if '1' not in remainder:
        print("No error detected in received data")
    else:
        print("Error detected in received data")

# Main function
if __name__ == "__main__":
    data = input("Enter the data bits: ")
    key = input("Enter the key (divisor): ")

    # Encoding
    encoded_data = encode(data, key)

```

```
# Decoding
print("\nDecoding the encoded data...")
decode(encoded_data, key)
```

Output

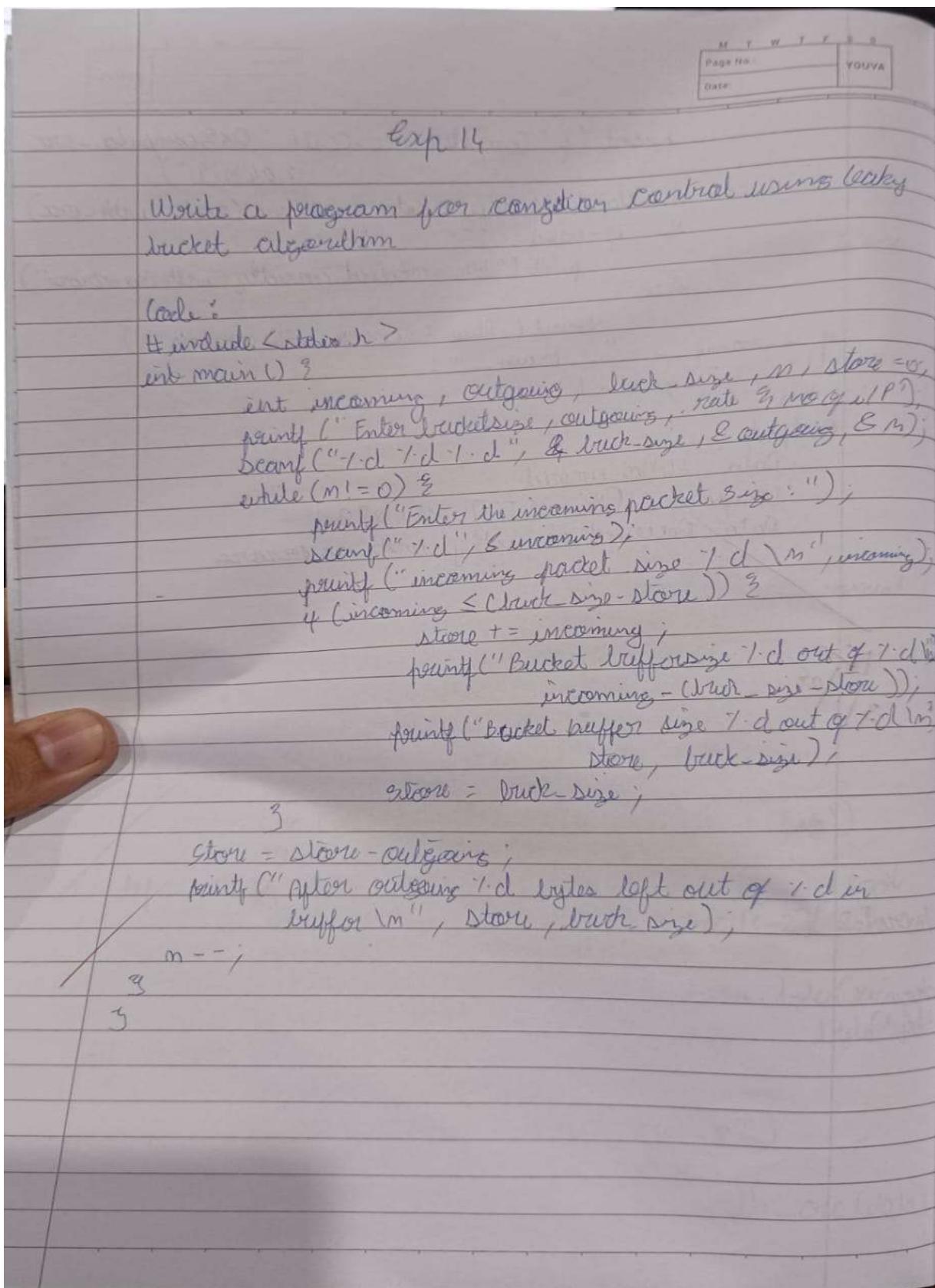
```
-----
Enter the data bits: 1001001000100100
Enter the key (divisor): 1101
Encoded Data: 1001001000100100111

Decoding the encoded data...
Remainder after decoding: 000
No error detected in received data
```

>>

LABORATORY PROGRAM – 14

Write a program for congestion control using Leaky bucket algorithm.



DECODED
Page No.:
Date: 10/10/2023

O/P: Enter bucket size, outgoing rate & no of IIP : 10
 Enter incoming packet size : 5
 Incoming packet SAC : 5
 Bucket buffer size 5 out of 10
 After outgoing 2 bytes left out of 10 in buffer
 After receiving
 Enter the incoming packet size : 15
 Incoming packet size : 5
 Bucket buffer size 1 out of 10
 After outgoing 4 bytes left out of 10 in buffer
 Enter the incoming packet size : 7
 Incoming packet size : 7
 Dropped buffer 4 out of 10
 After outgoing 7 bytes left out of 10 in buffer

N
3/1/25

Code:

```
import random
import time

# Constants
NOF_PACKETS = 5

def send_packet(packet_size, output_rate):
    """Simulate sending packets."""
    while packet_size > 0:
        sent = min(packet_size, output_rate)
        print(f"Packet of size {sent} Transmitted---", end="")
        packet_size -= sent
        print(f"Bytes Remaining to Transmit: {packet_size}")
        time.sleep(1) # Simulate time delay between packets

def main():
    # Generate random packet sizes
    packet_size = [random.randint(0, 99) for _ in range(NOF_PACKETS)]
```

```
for i in range(NOF_PACKETS):
    print(f"packet[{i}]: {packet_size[i]} bytes")

# Input output rate and bucket size
output_rate = int(input("Enter the Output rate: "))
bucket_size = int(input("Enter the Bucket Size: "))

# Process each packet
for i in range(NOF_PACKETS):
    print(f"\nIncoming Packet size: {packet_size[i]}")
    if packet_size[i] > bucket_size:
        print(f"Incoming packet size ({packet_size[i]} bytes) is Greater than bucket capacity
({bucket_size} bytes) - PACKET REJECTED")
        continue

    print(f"Bytes remaining to Transmit: {packet_size[i]}")
    send_packet(packet_size[i], output_rate)

if __name__ == "__main__":
    main()
```

Output

Cl

```
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: 86
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: 93
Incoming packet size (93bytes) is Greater than bucket capacity (85bytes)-PACKET REJECTED

==== Code Execution Successful ====
```

LABORATORY PROGRAM – 15(A)

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.

Exp 15 a)

using TCP / IP Sockets , write a client server prog
to make client sending the file name and the server to
send back the contents of the requested file if present.

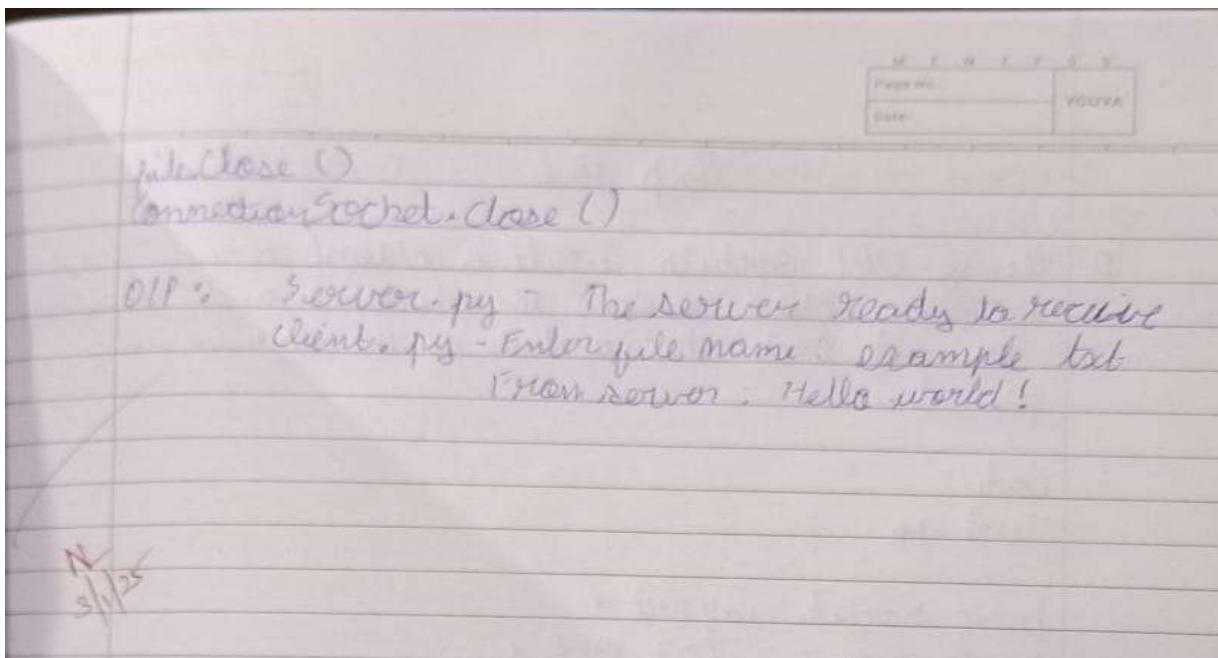
code :

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()
print("The server is ready to receive")
while True:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()
    file = open(sentence, "r")
    data = file.read(1024)
    connectionSocket.send(data.encode())
    file.close()
    connectionSocket.close()
```



Code: Client.py

```

from socket import * serverName = "127.0.0.1" # Server
address (localhost) serverPort = 12000 # Port number
where the server listens

# Create TCP socket
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort)) # Connect to server

# Ask user for file name to request
sentence = input("Enter file name: ")

# Send file name to server
clientSocket.send(sentence.encode())

# Receive file contents from server
filecontents = clientSocket.recv(1024).decode()
print('From Server:', filecontents)

# Close the connection
clientSocket.close()

```

Code: Server.py

```
from socket import *
```

```

serverName = "127.0.0.1" # Server address (localhost)
serverPort = 12000 # Port number to listen on

# Create TCP socket
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort)) # Bind socket to the address and
port serverSocket.listen(1) # Listen for 1 connection print("The server is ready to
receive")

while True:
    # Accept a connection
    connectionSocket, addr = serverSocket.accept()

    # Receive the file name from the client
    sentence = connectionSocket.recv(1024).decode()

    # Try opening the file
    try:
        file = open(sentence, "r") # Open file in read mode
        fileContents = file.read(1024) # Read file content (up to 1024 bytes)
        connectionSocket.send(fileContents.encode()) # Send file contents to client
        file.close()
    except FileNotFoundError:
        # Send error message if file not found
        connectionSocket.send("File not found".encode())

    # Close the connection
    connectionSocket.close()

```

Output

The screenshot displays two terminal windows side-by-side. The left terminal window shows the execution of a Python script named `tcpclient.py`. The user enters the file name `tcpserver.py`, and the client connects to the server at port 63454. The right terminal window shows the execution of a Python script named `tcpserver.py`. The server is ready to receive connections and prints the contents of the received file `tcpserver.py`.

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS [?] PowerShell T □

PS C:\Users\91934\OneDrive\Desktop\Experiment_15> py tcpclient.py
Enter file name: tcpserver.py
From Server:
from socket import *

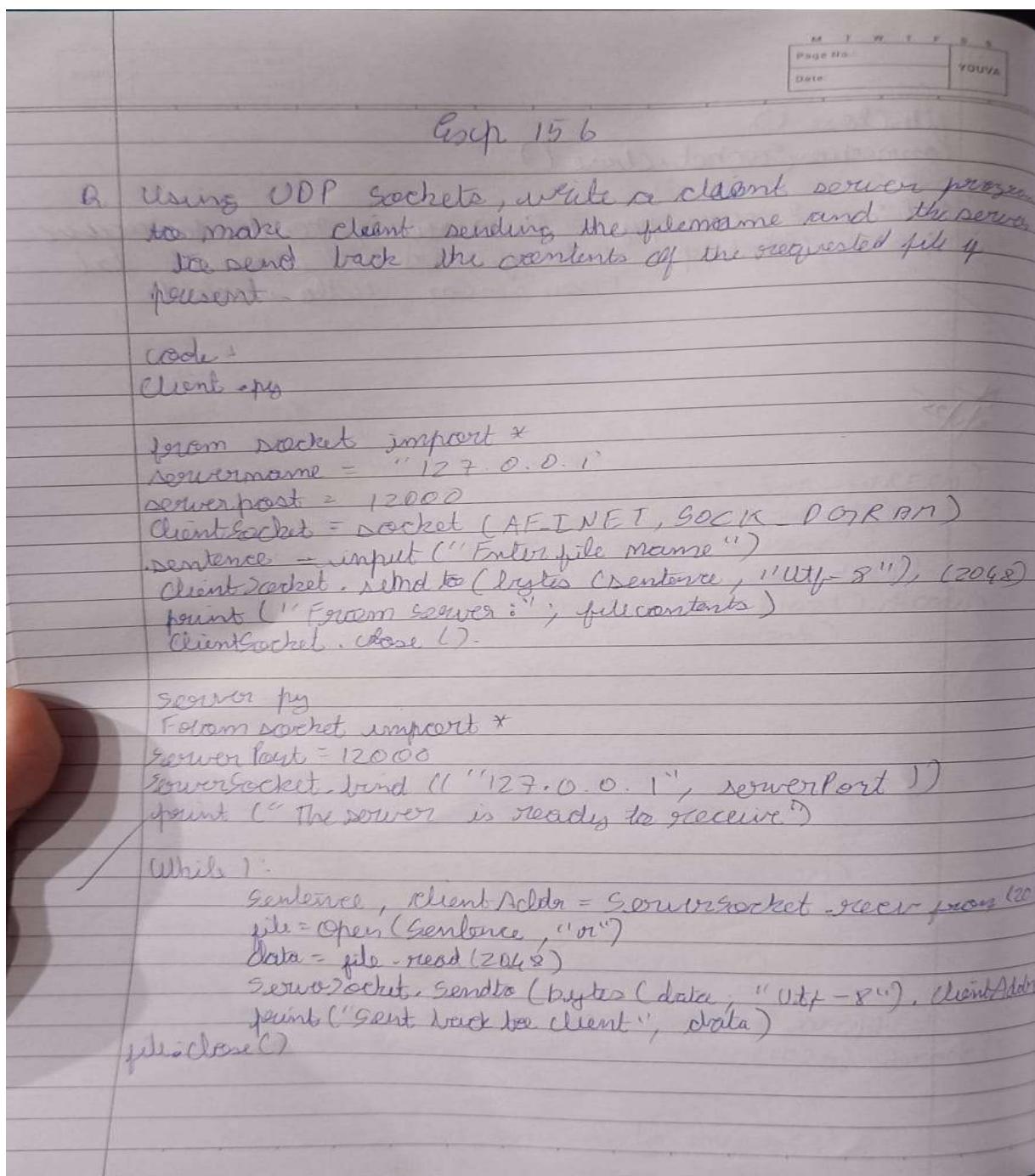
serverName, serverPort = "127.0.0.1", 12000
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)
print("Server ready to receive")

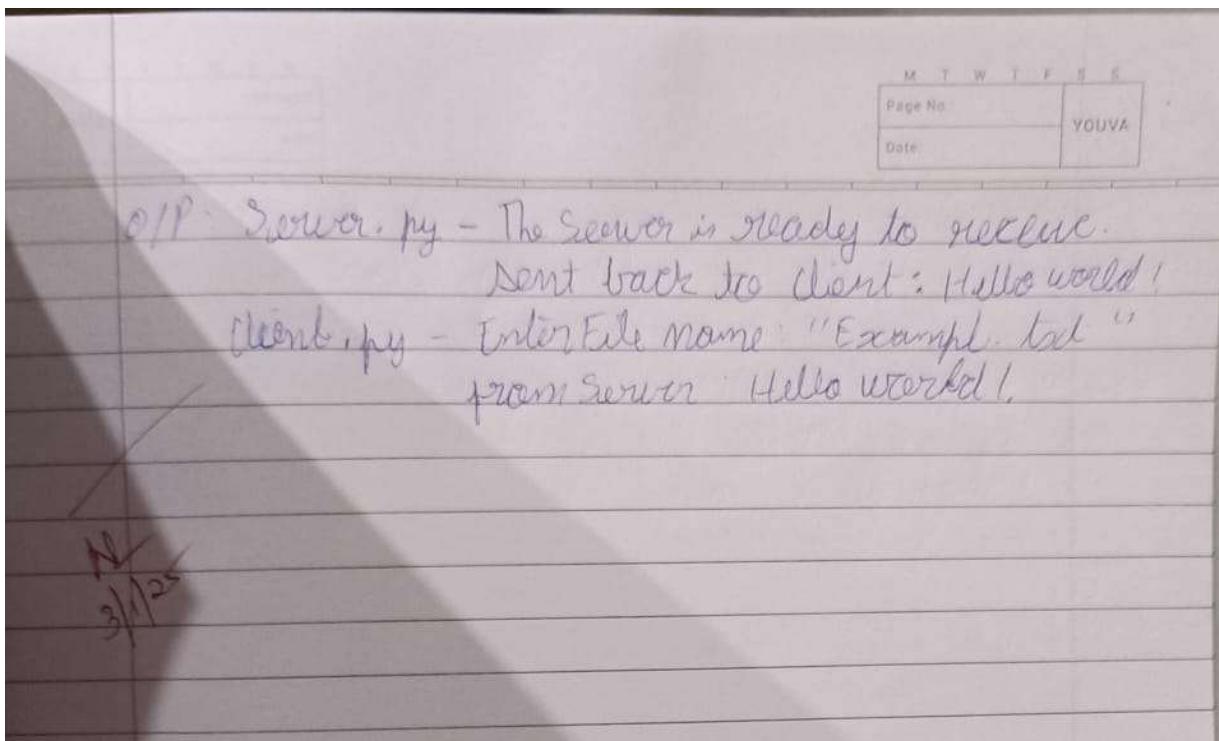
while True:
    conn, addr = serverSocket.accept()
    serverName, serverPort = "127.0.0.1", 12000
    serverSocket.bind((serverName, serverPort))
    serverSocket.listen(1)
    print("Server ready to receive")

PS C:\Users\91934\OneDrive\Desktop\Experiment_15> py tcpserver.py
Server ready to receive
Connected to ('127.0.0.1', 63454)
Sent contents of tcpserver.py
[]
```

LABORATORY PROGRAM – 15(B)

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: ClientUDP.py

```
from socket import *
serverName, serverPort = "127.0.0.1", 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
filename = input("Enter file name: ")
clientSocket.sendto(filename.encode(), (serverName, serverPort))
data, _ = clientSocket.recvfrom(2048)
print("From Server:", data.decode())
clientSocket.close()
```

Code: ServerUDP.py

```
from socket import *
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", 12000))
print("Server ready to receive")

while True:
    filename, clientAddress = serverSocket.recvfrom(2048)
    try:
        with open(filename.decode(), "r") as file:
            serverSocket.sendto(file.read(2048).encode(), clientAddress)
    except FileNotFoundError:
        serverSocket.sendto("File not found".encode(), clientAddress)
```

Output

The screenshot shows two terminal windows side-by-side. The left window is titled 'powershell' and contains the code for ClientUDP.py. The right window is also titled 'powershell' and contains the code for ServerUDP.py. Both windows show the command 'py' followed by the script name.

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\91934\OneDrive\Desktop\Experiment_15(b)> py ClientUDP.py
Enter file name: ServerUDP.py
From Server: from socket import *
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", 12000))
print("Server ready to receive")

while True:
    filename, clientAddress = serverSocket.recvfrom(2048)
    try:
        with open(filename.decode(), "r") as file:
            serverSocket.sendto(file.read(2048).encode(), clientAddress)
    except FileNotFoundError:
        serverSocket.sendto("File not found".encode(), clientAddress)

PS C:\Users\91934\OneDrive\Desktop\Experiment_15(b)> py ServerUDP.py
Server ready to receive
```