VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB RECORD

Computer Networks Laboratory(23CS5PCCON)

Submitted by

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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.

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BMSCE, Bengaluru

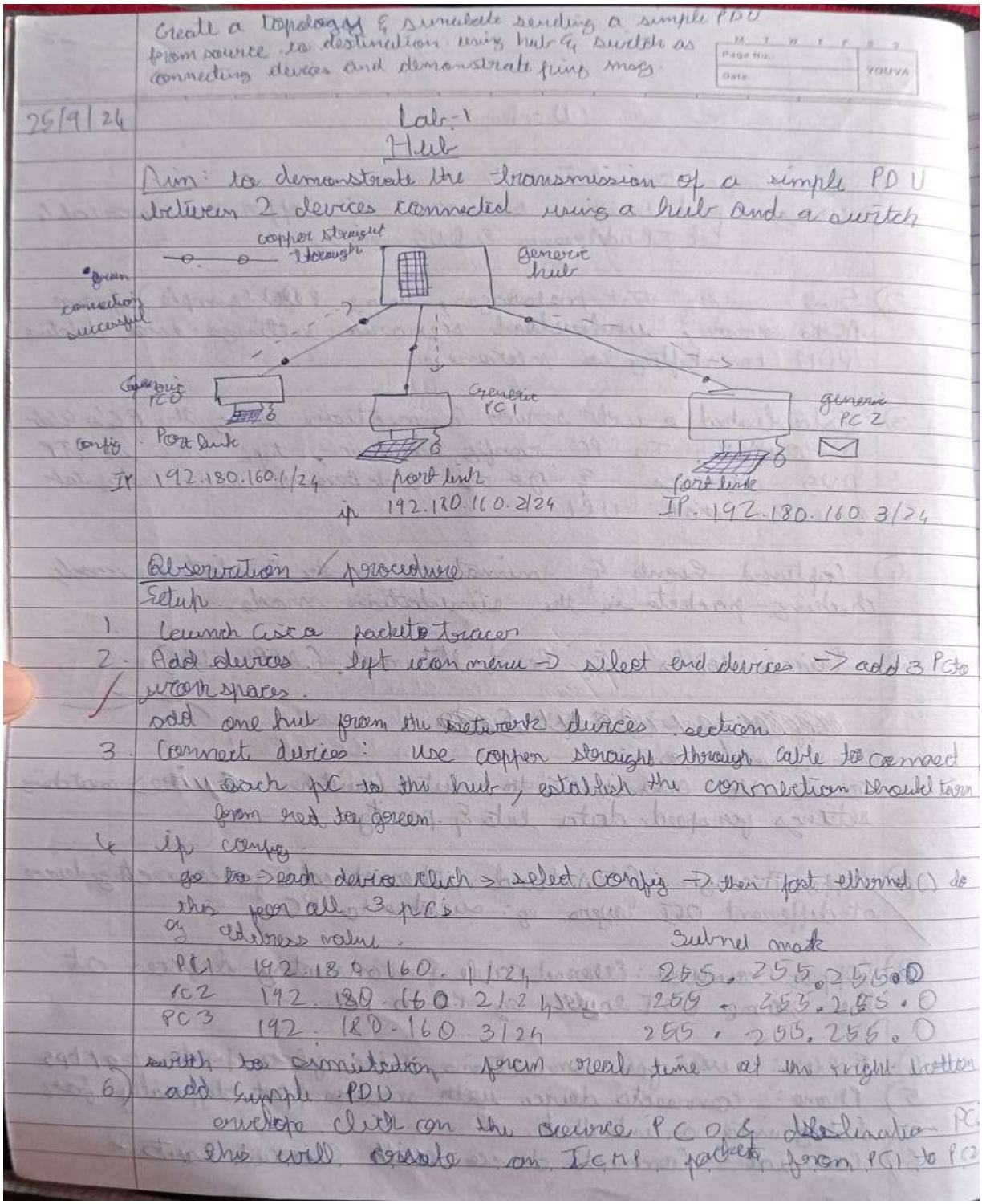
INDEX

CYCLE-1

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.



7) Run the simulation / click auto capture / play

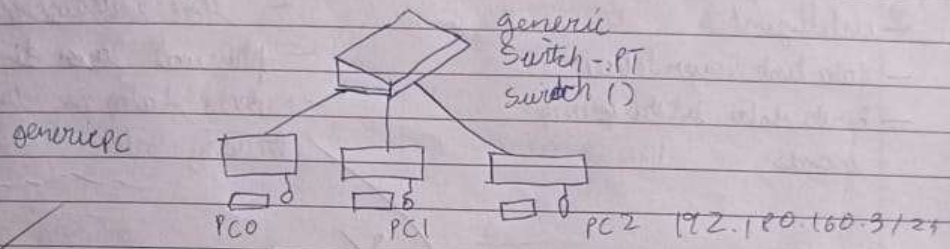
Result (observation)

→ from PC0 to P2 & P1 the PDU (protocol data Unit)
→ return msg/PDU is sent from PC2 to PC0 that it is received.
→ but only PC2 will accept the PDU hence ✗ mark on P1

Since it is hub broadcast happens to all connected to hub only intended PC will be received.

Switch

Connecting PC to switch.



IP 192.180.160.1/24 192.180.160.2/24

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 PC() 1 2 to switch ports using copper straight through
4. setup devices by providing ip's
   Go to config → fast ethernet → input i/p

IP 1	192.180.160.1
IP 2	192.180.160.2
IP 3	192.180.160.3

5) Switch to simulation mode choose cable event / protocol
6) Add PDU to source & destination to PC 2
7) Run simulation Auto capture / play
i cmp (ping) are sent to only correct device with correct mac

Observation

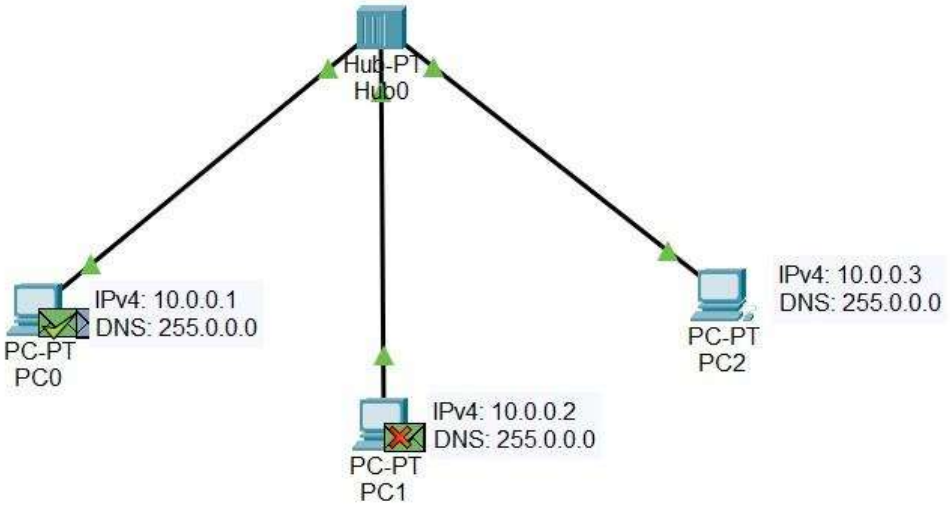
8) Result switch uses mac address to intelligently forward the ping (icmp) packets to the correct destination rather than broadcasting to all connected devices like a hub would

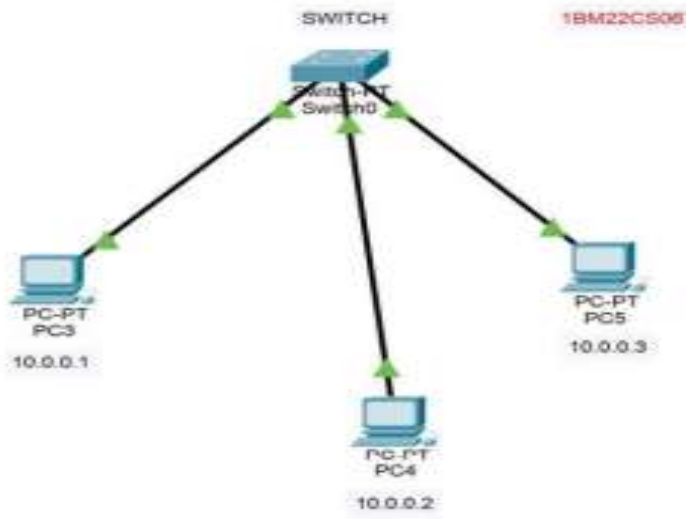
Difference

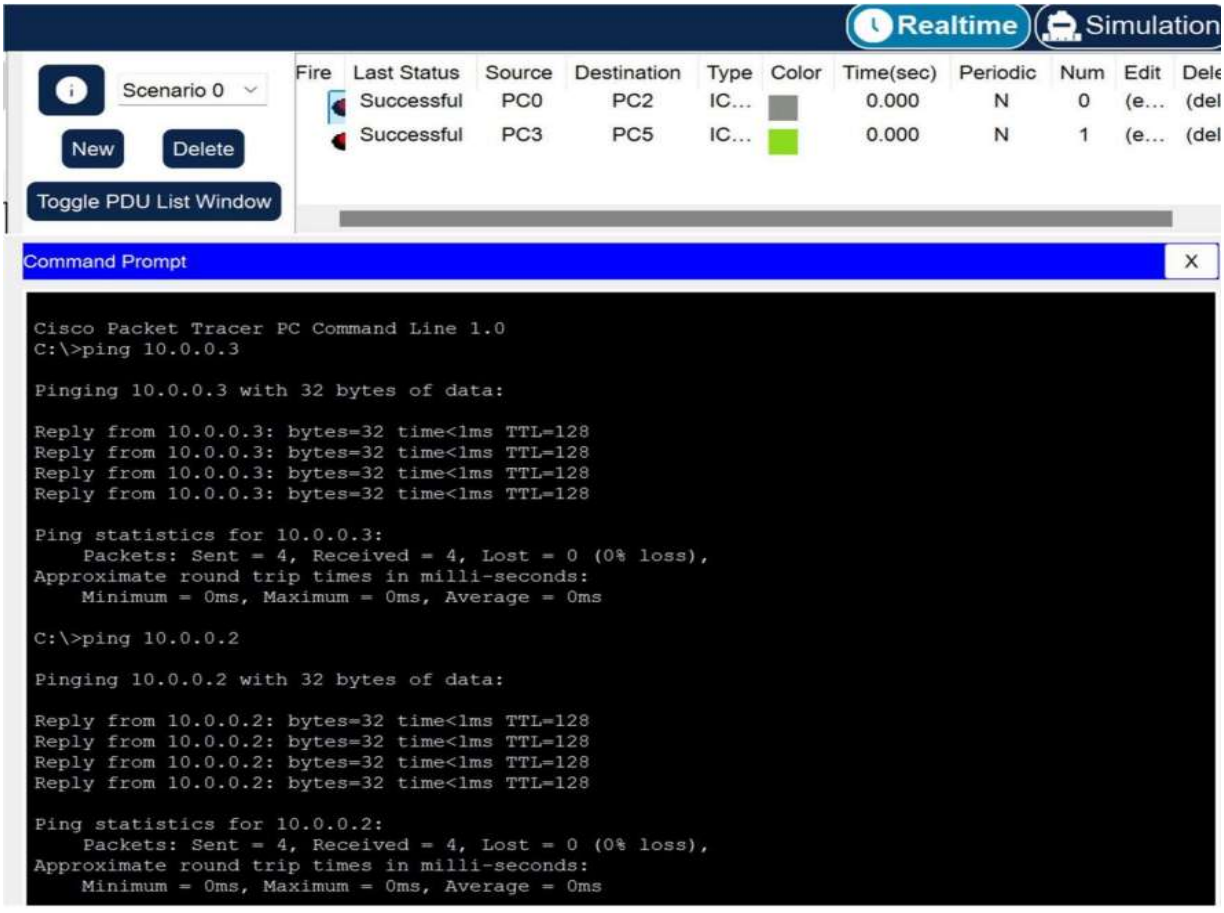
Switches	Hubs
- direct to mac	- broadcast mode
- intelligent	- Not intelligent
- data link layer device	- physical layer device
- sends data in the form of frames	- sends data in the form of binary bits

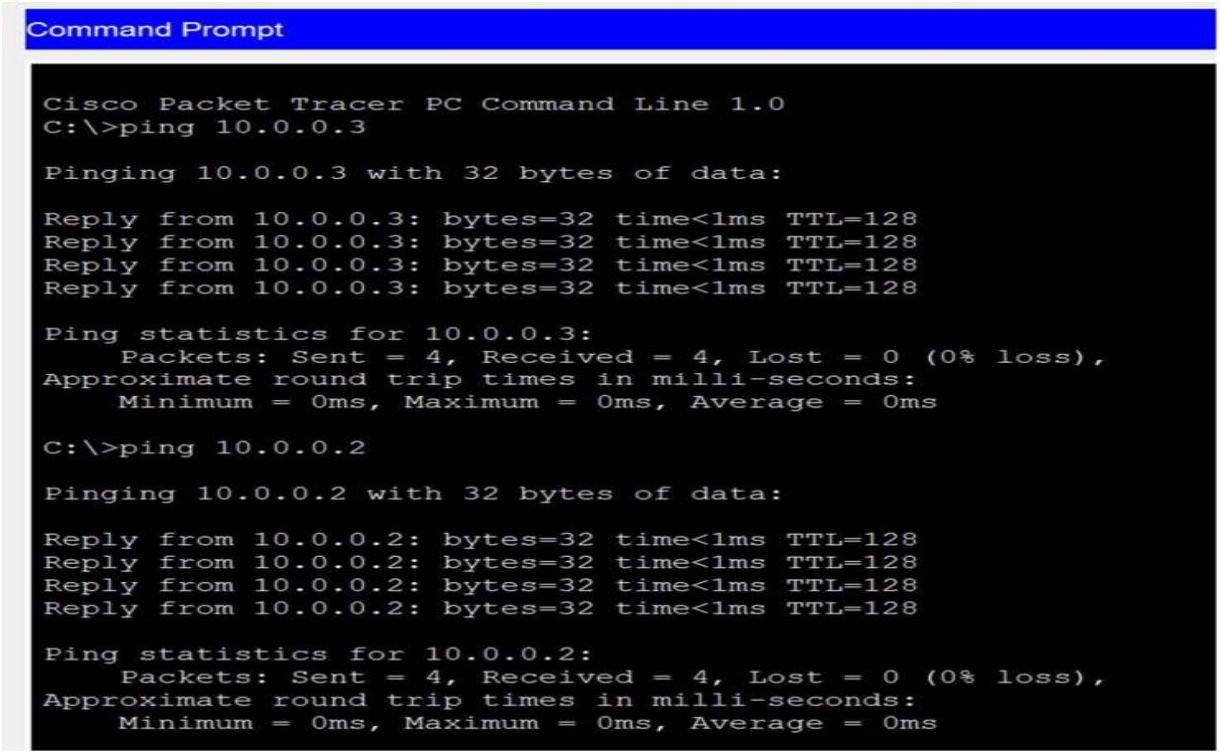
Transmission Media

25/9/24



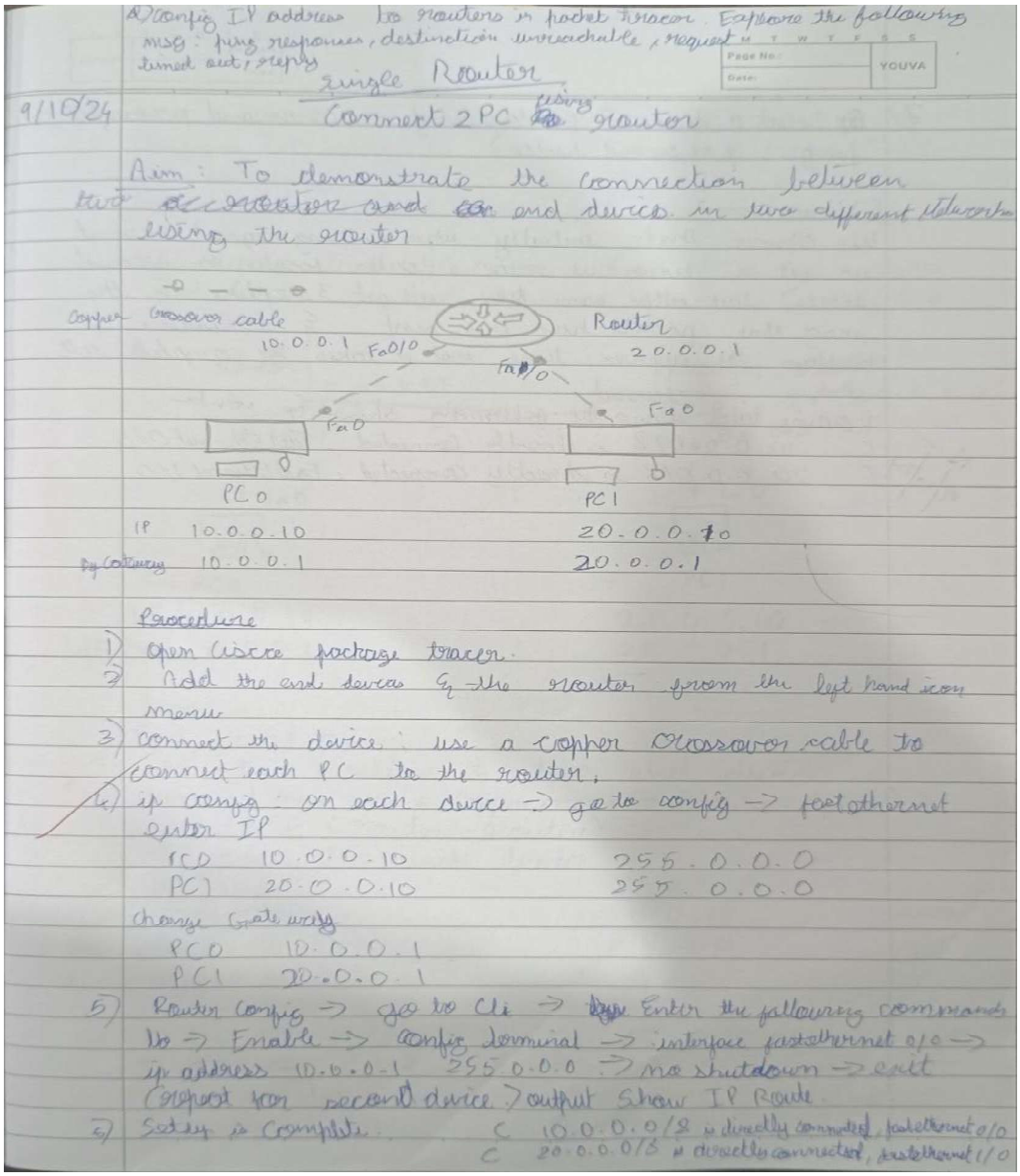

SWITCH
1BM22CS06
PC-PT
PC3
10.0.0.1
PC-PT
PC5
10.0.0.3
PC-PT
PC4
10.0.0.2


Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Successful
PC0
PC2
IC...
0.000
N
0
Successful
PC3
PC5
IC...
0.000
N
1
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
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
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
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128
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
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
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
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128
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.



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

Page No.: Date: YOUVA

Single Router

9/10/24

Connect 2 PC using router

Aim: To demonstrate the connection between two pc and device in two different networks using the router

Copper Crossover cable

Router

10.0.0.1 Fa0/0 Fa0/0 20.0.0.1

Fa0 Fa0

PC0 PC1

IP	10.0.0.10	20.0.0.10
Default Gateway	10.0.0.1	20.0.0.1

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	10.0.0.10	255.0.0.0
PC1	20.0.0.10	255.0.0.0

Change Gateway

PC0	10.0.0.1
PC1	20.0.0.1

5) Router config → go to CLI → Enter the following commands → 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

7) Select a device → go to desktop → command prompt → ping (ip of second device)

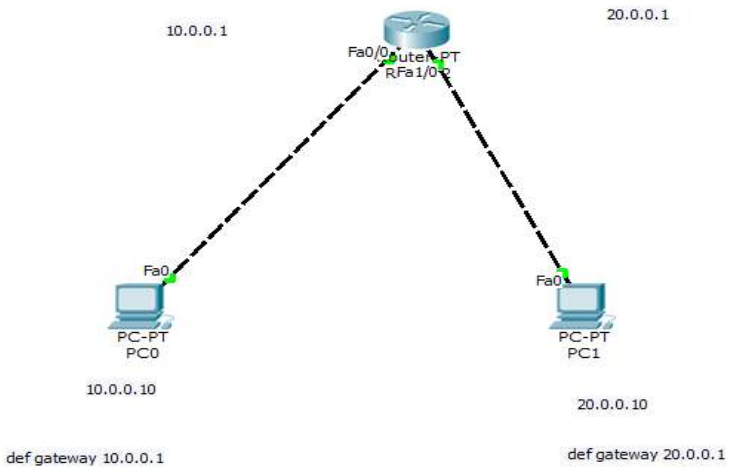
Observation

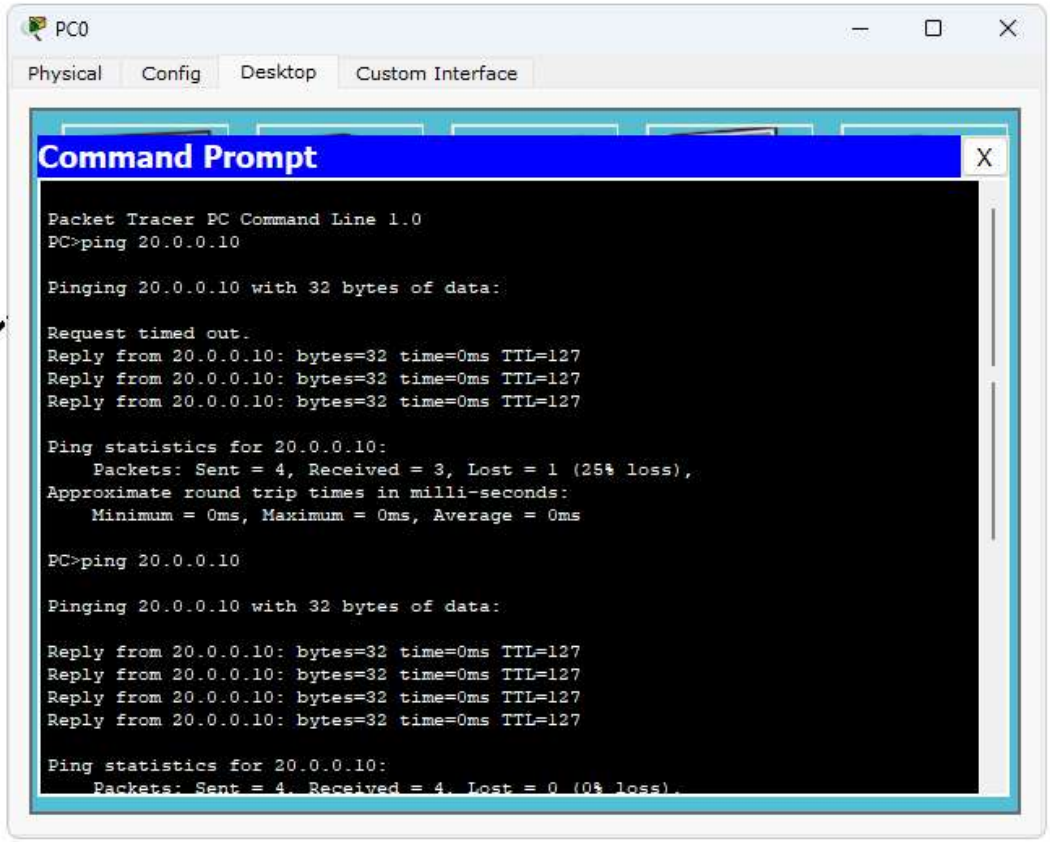
We observe that initially when the ping request is sent we get a time out error (Router locates the second device) but after some time we get 3 replies & the msg that packets have been sent & received. & displays the approx time that it takes to complete all this.

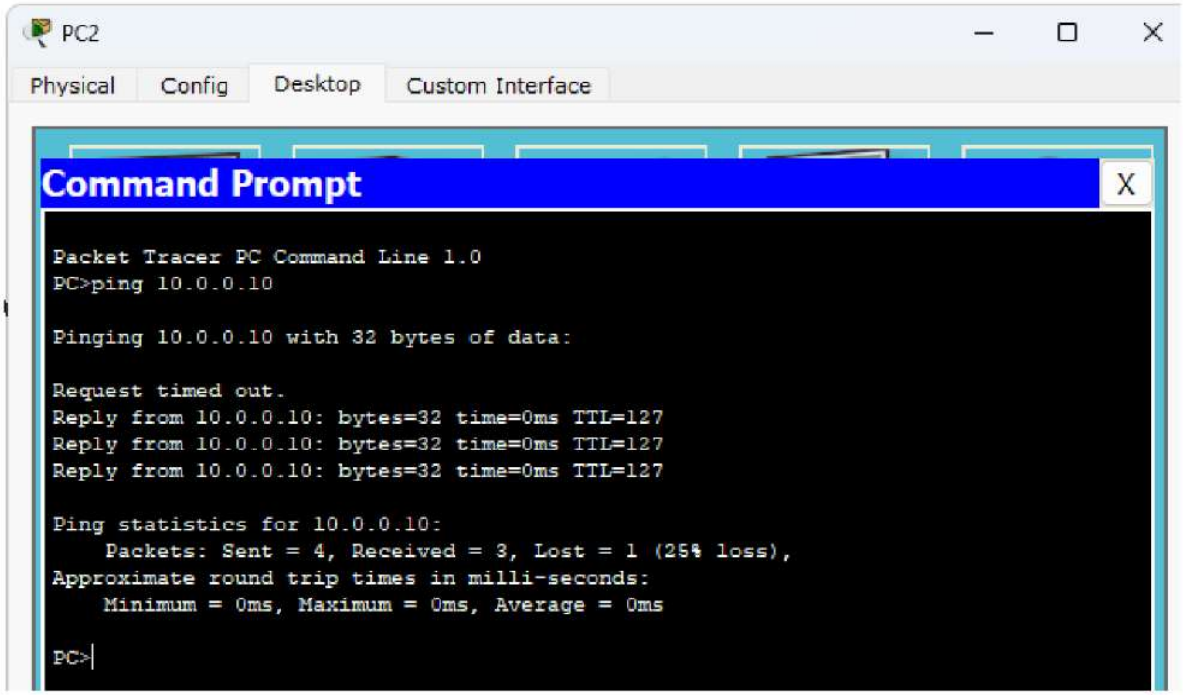
Routing table shows the following show ip route observed.

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

C 20.0.0.0/8 is directly connected, FastEthernet 1/0

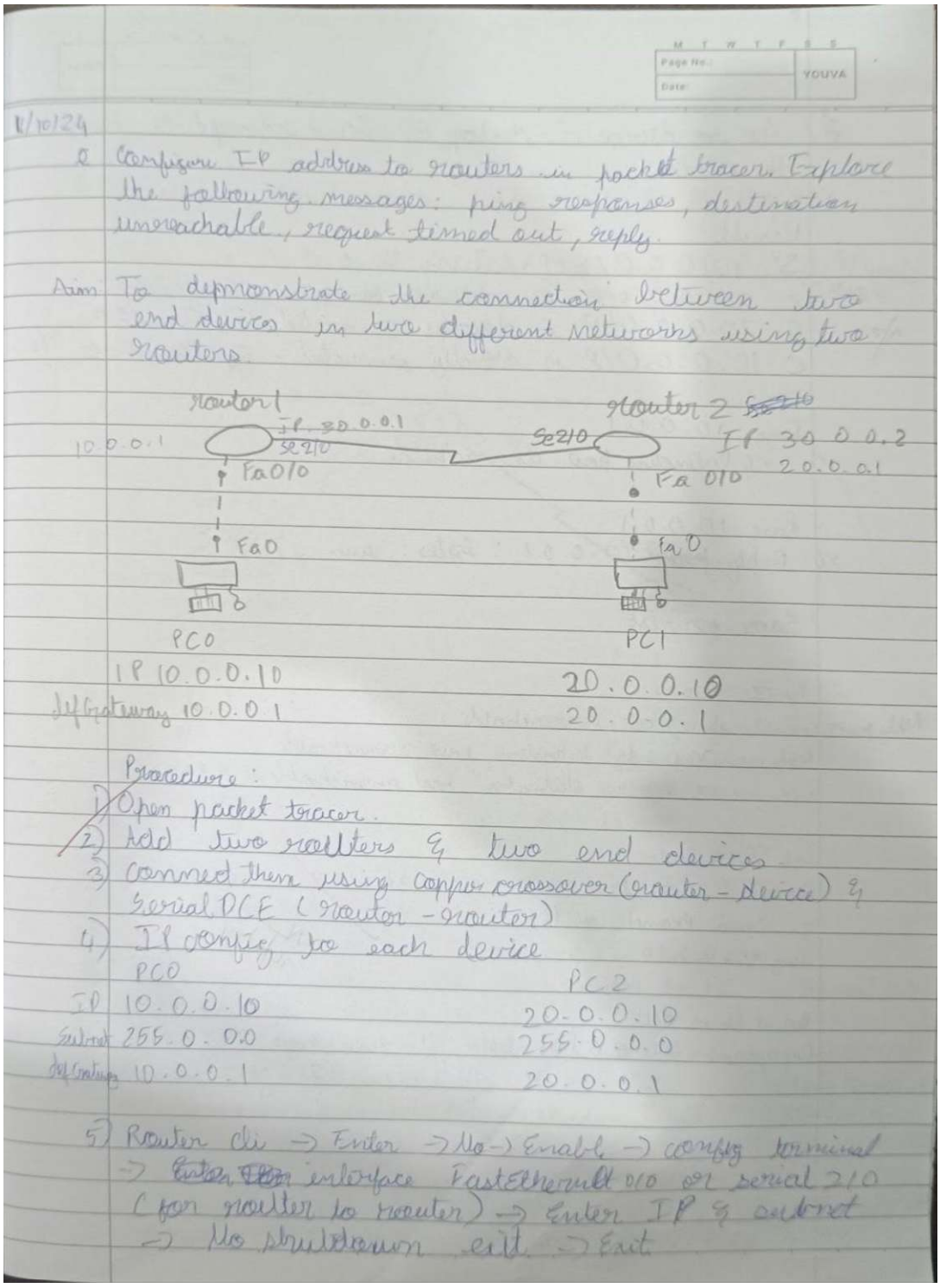



PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.10
Pinging 20.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes=32 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
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:


PC2
Physical
Config
Desktop
Custom Interface
Command Prompt
X
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.



Page No.: YOUVA
Date:

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.

router1 — IP 30.0.0.1 — S2/0 — 10.0.0.1 — Fa0/0 — Fa0 — PC0

router2 — S2/0 — IP 30.0.0.2 — Fa 0/0 — 20.0.0.1 — Fa0 — PC1

PC0
IP 10.0.0.10
Default gateway 10.0.0.1

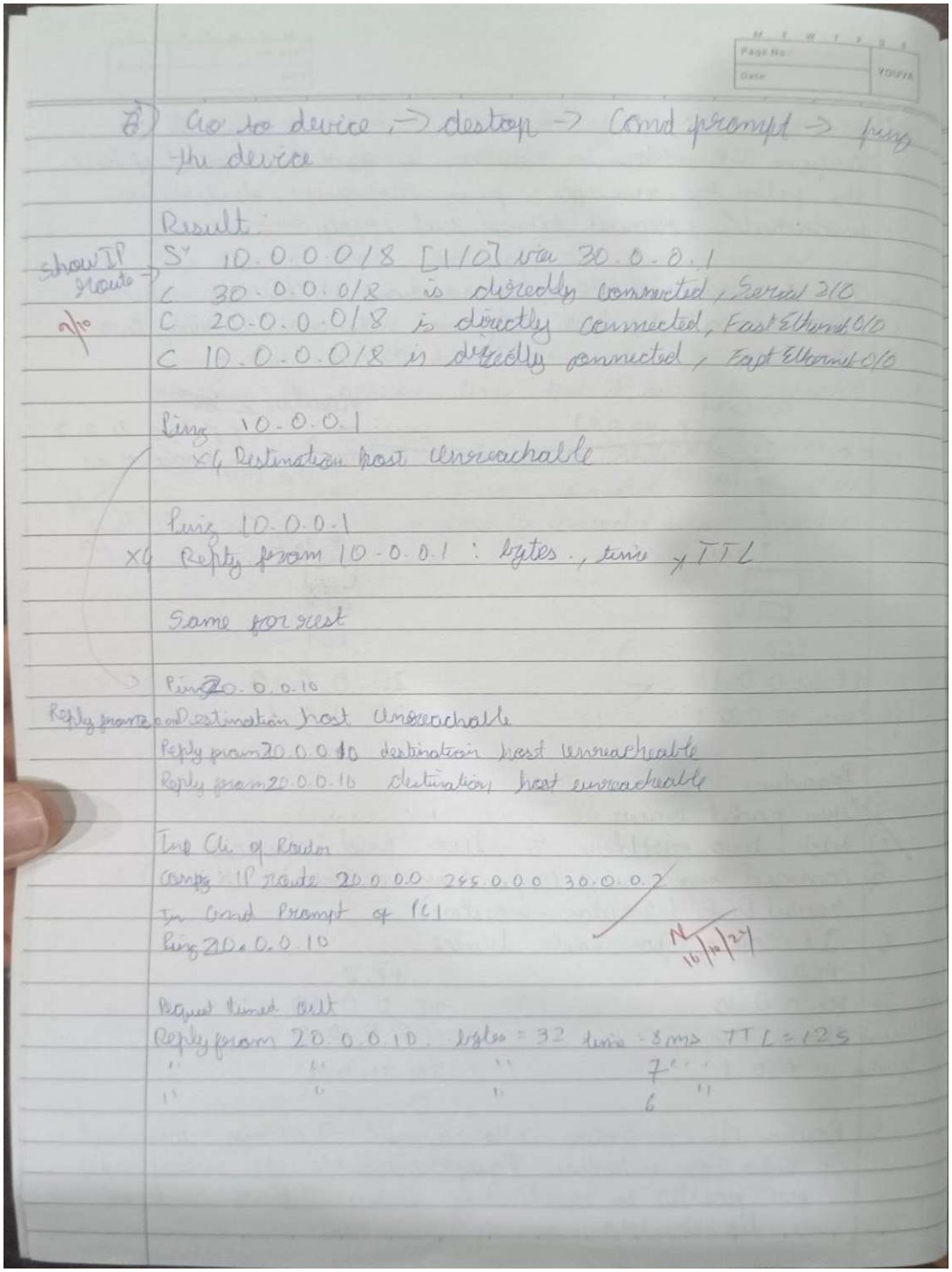
PC1
20.0.0.10
20.0.0.1

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 to each device

	PC0	PC2
IP	10.0.0.10	20.0.0.10
Subnet	255.0.0.0	255.0.0.0
Default Gateway	10.0.0.1	20.0.0.1

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



8) Go to device -> destop -> Cmd prompt -> 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
C 20.0.0.0/8 is directly connected, FastEthernet 0/0
C 10.0.0.0/8 is directly connected, FastEthernet 0/0

Ping 10.0.0.1
Destination host unreachable

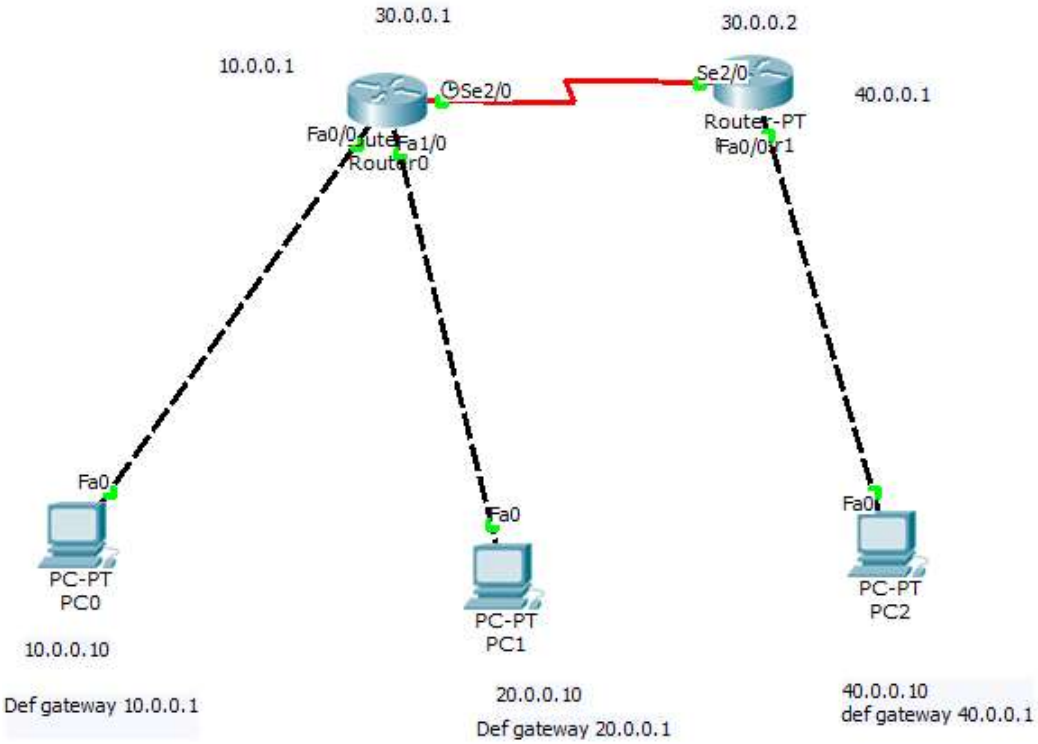
Ping 10.0.0.1
Reply from 10.0.0.1 : bytes., time, TTL

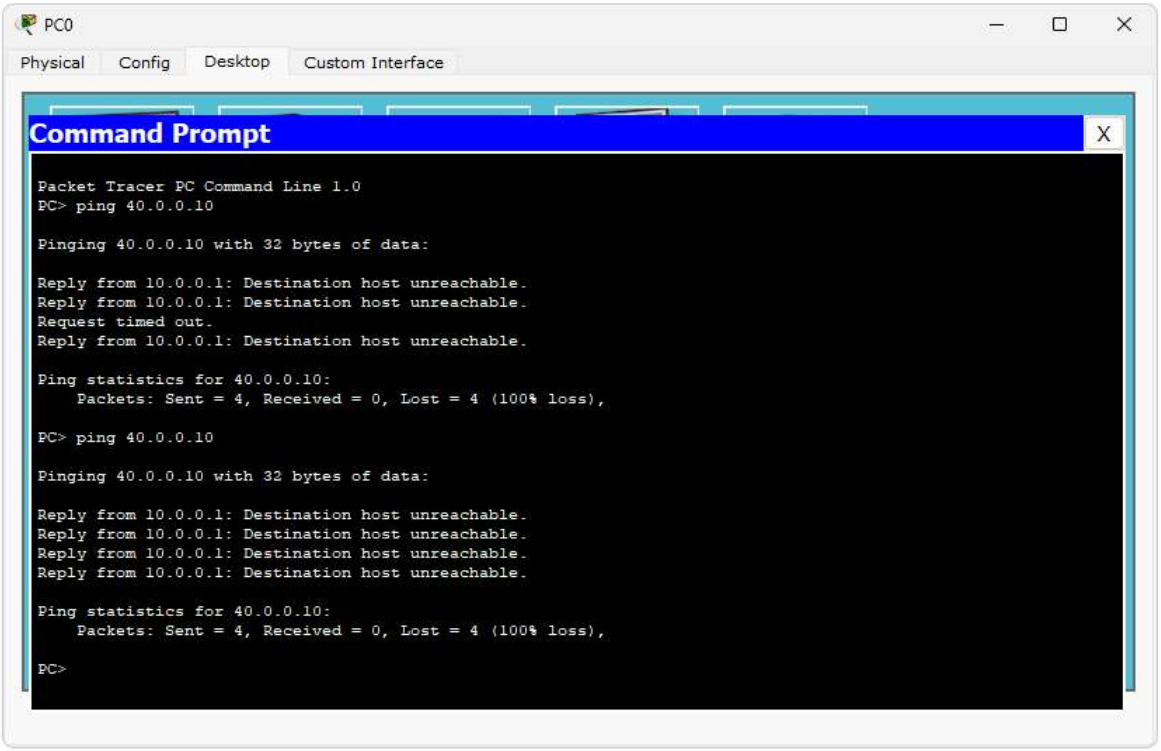
Same for rest

Ping 20.0.0.10
Reply from Destination host unreachable
Reply from 20.0.0.10 destination host unreachable
Reply from 20.0.0.10 destination host unreachable

In CLI of Router
Config: IP route 20.0.0.0 255.0.0.0 30.0.0.2
In Cmd Prompt of PC1
Ping 20.0.0.10

Request timed out
Reply from 20.0.0.10 bytes = 32 time = 8ms TTL = 125


30.0.0.1
30.0.0.2
10.0.0.1
Se2/0
Se2/0
40.0.0.1
Fa0/0
Fa1/0
Router0
Router-PT
Fa0/0
Fa0
Fa0
Fa0
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
10.0.0.10
Def gateway 10.0.0.1
20.0.0.10
Def gateway 20.0.0.1
40.0.0.10
def gateway 40.0.0.1


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
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.
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.
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#
```

Copy Paste

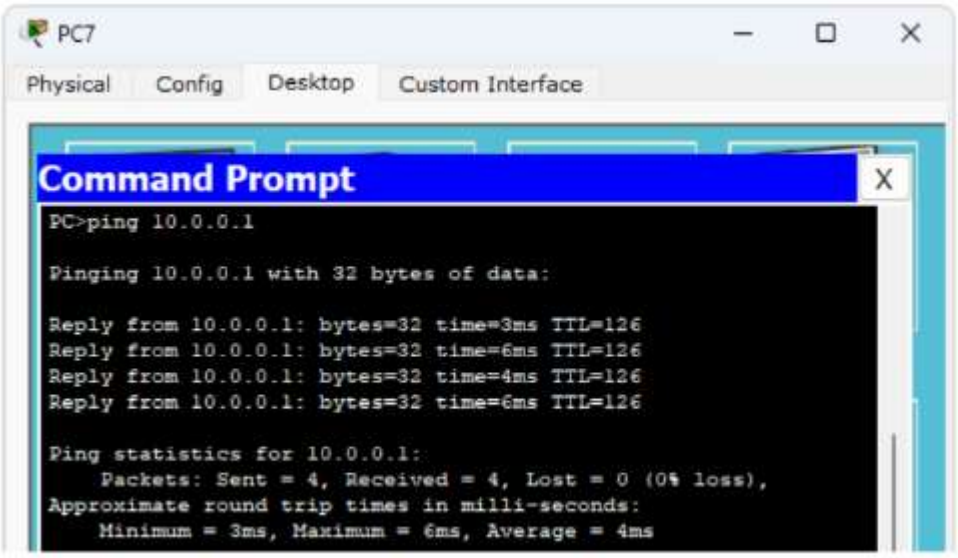
Router0

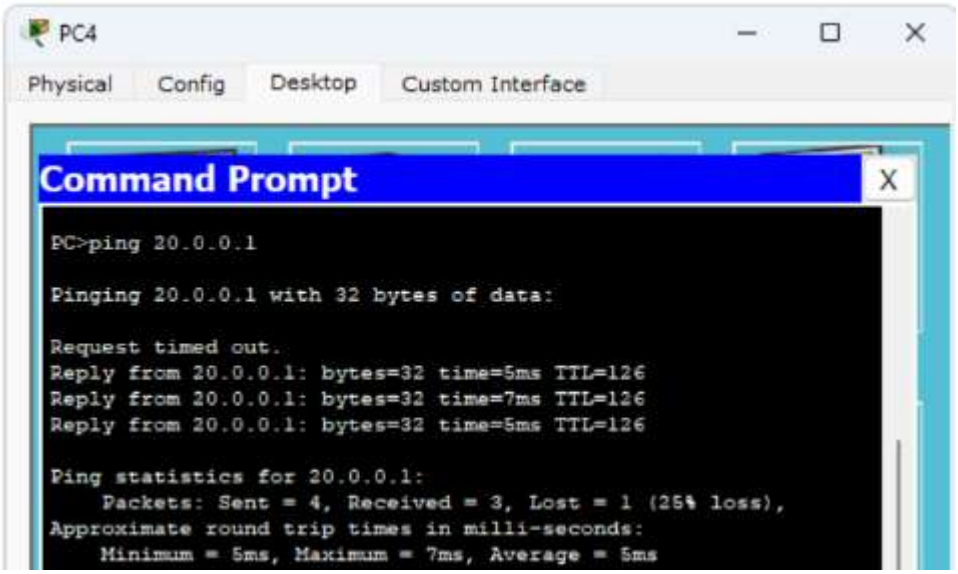
Physical Config CLI

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#
```

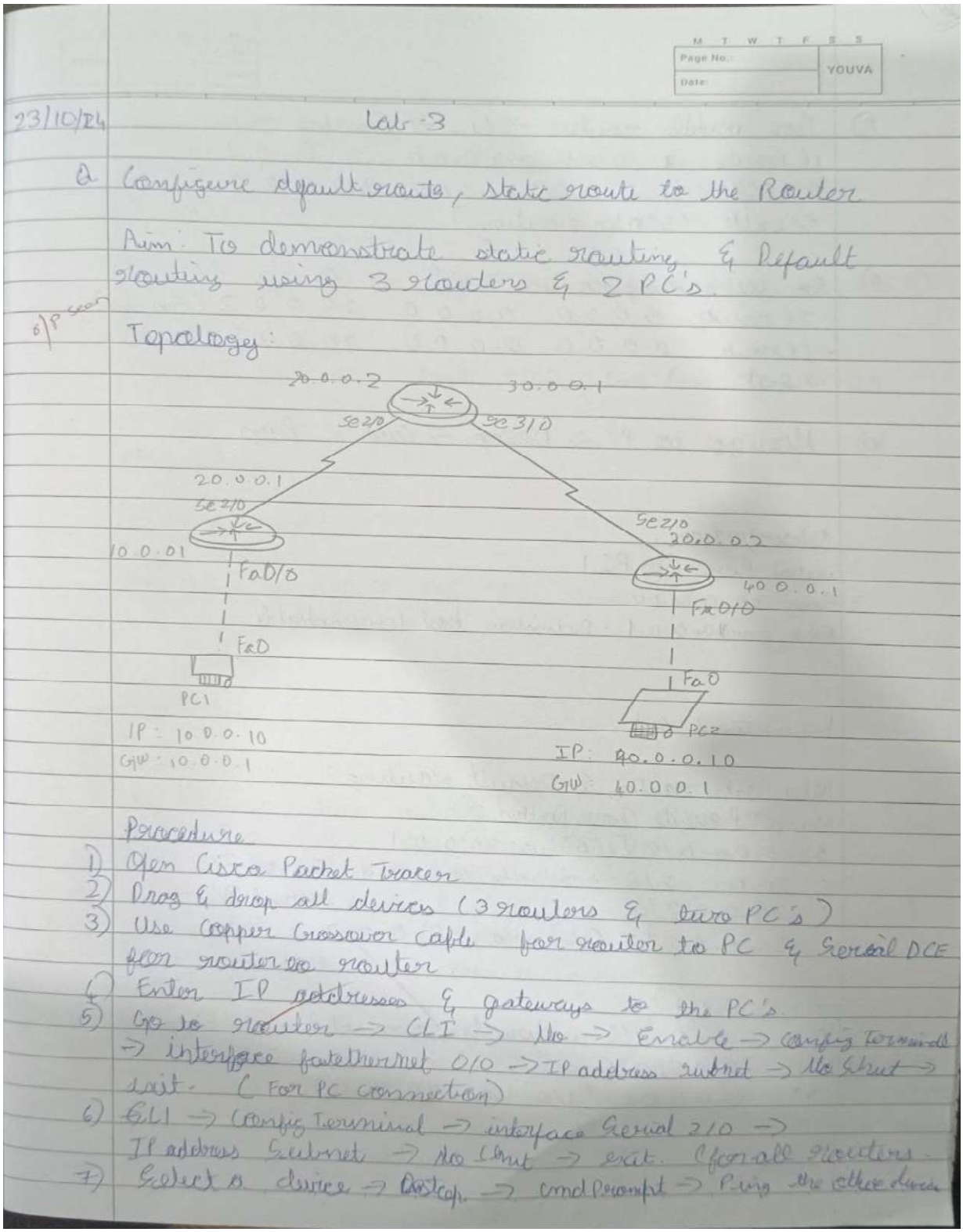
Copy Paste


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 = 5ms

LABORATORY PROGRAM – 3

Configure default route, static route to the Router.



8) For middle router → Cli → Config →
IP Route 10.0.0.0 255.0.0.0 20.0.0.1
→ IP Route IP.0.0.0 255.0.0.0 30.0.0.2
→ exit (Static routing)

9) For left & right routers → Cli → Config →
IP route 0.0.0.0 0.0.0.0 20.0.0.2 (For left)
→ IP route 0.0.0.0 0.0.0.0 30.0.0.1 (for right)
→ exit

10) Now go to PC → Destop → Cmp → Ping.

Observation:
initial Pings On PC1
Ping 60.0.0.10
Reply from 0.0.0.1 : 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

→

(for router 3)

C 30.0.0.0/8 is directly connected, Serial 2/0
C 60.0.0.0/0 " , FastEthernet 0/0
S* 0.0.0.0/0 [1/0] via 30.0.0.1

(In PC1 cmd) (After Static & Default Routing Step 8 & 9)

Ping 40.0.0.10

Request timed out

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

" " "

Ping Statistics

(In PC 2 cmd)

Ping 10.0.0.10

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

" " "

Ping Statistics

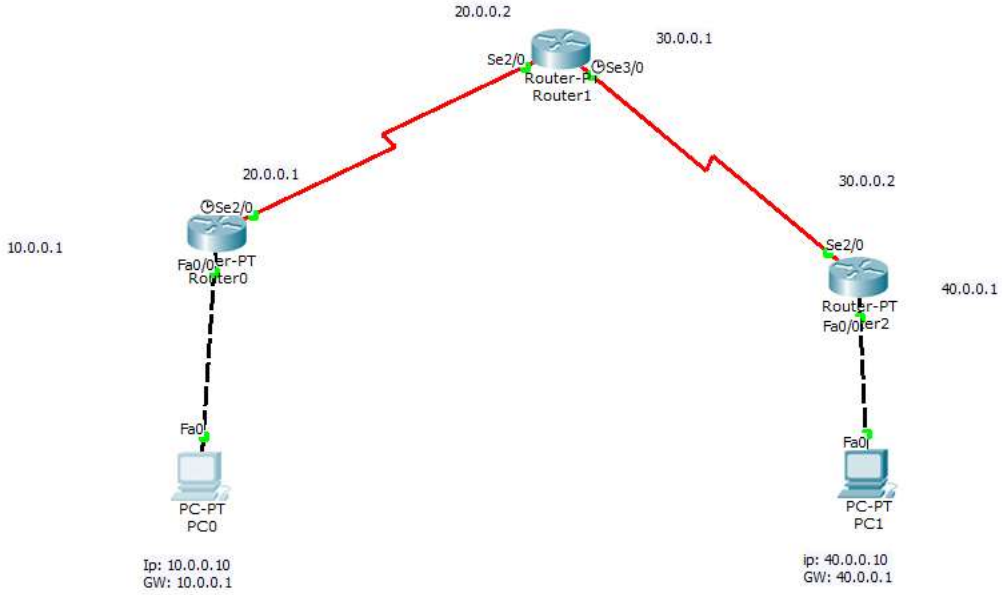
Observation

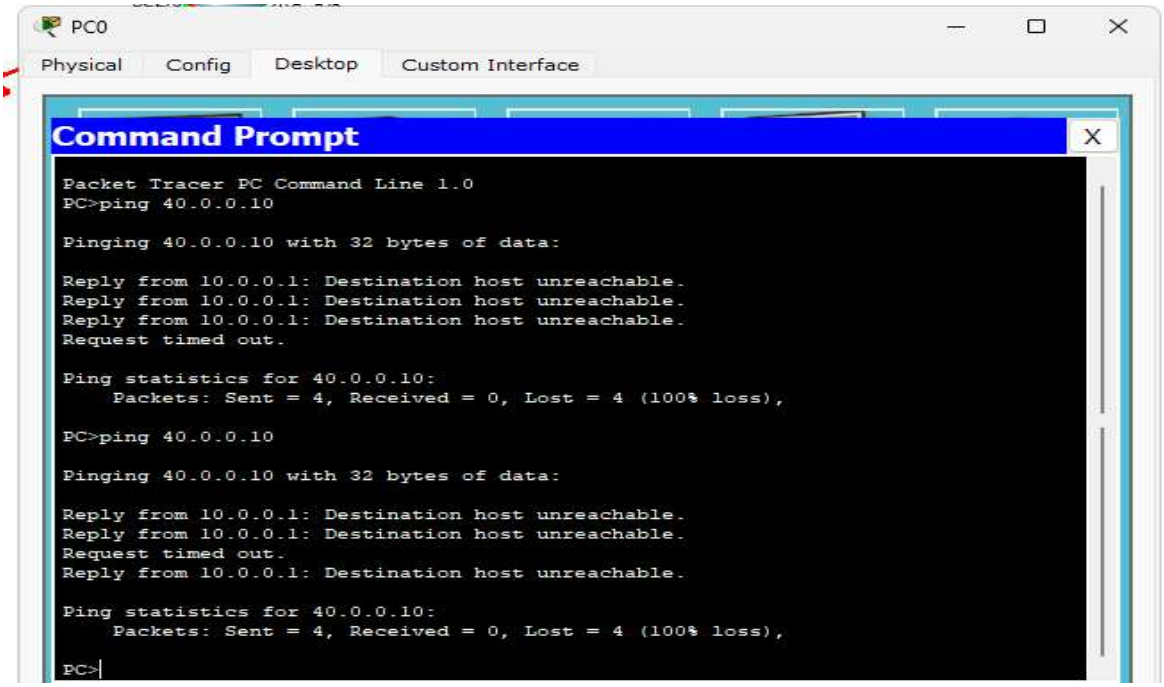
We observe that initially even after the initial configuration for routers & PCs are completed the Ping out terms out unreachable. But After performing static routing for the middle router & default routing for the ones connected to the PCs, we get a positive Ping reply in both ways, Thus a Connection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

28/10/24

Static Routing is done to Specify the complete route for data transmissions

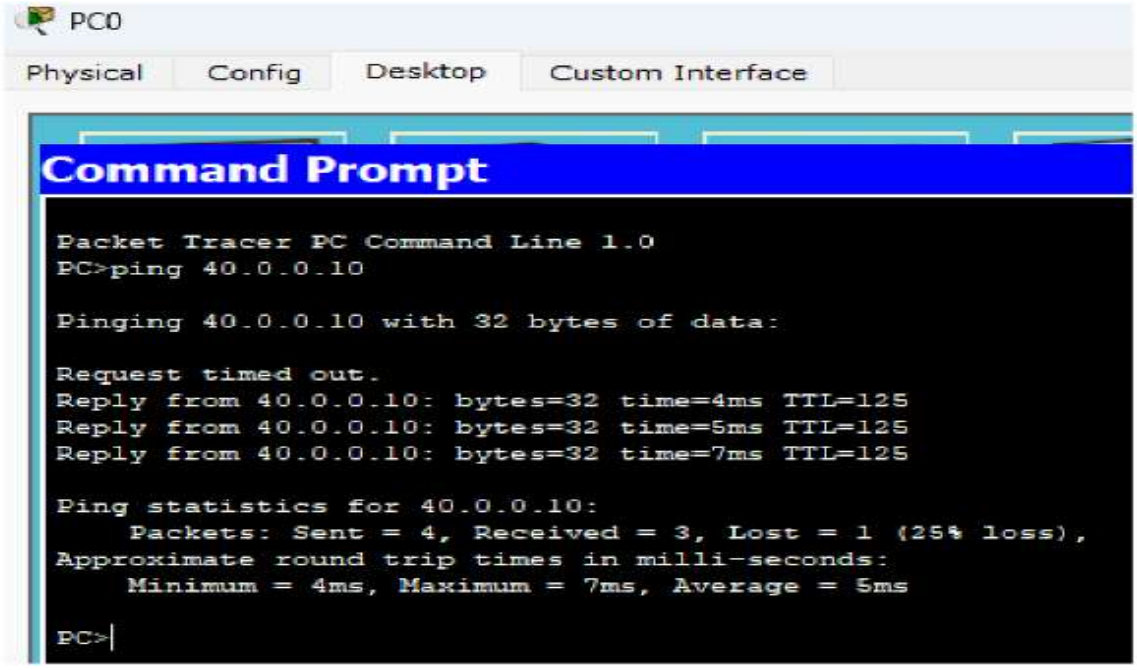
Default Routing is done when source can be anything but destination is specified for data transmissions.

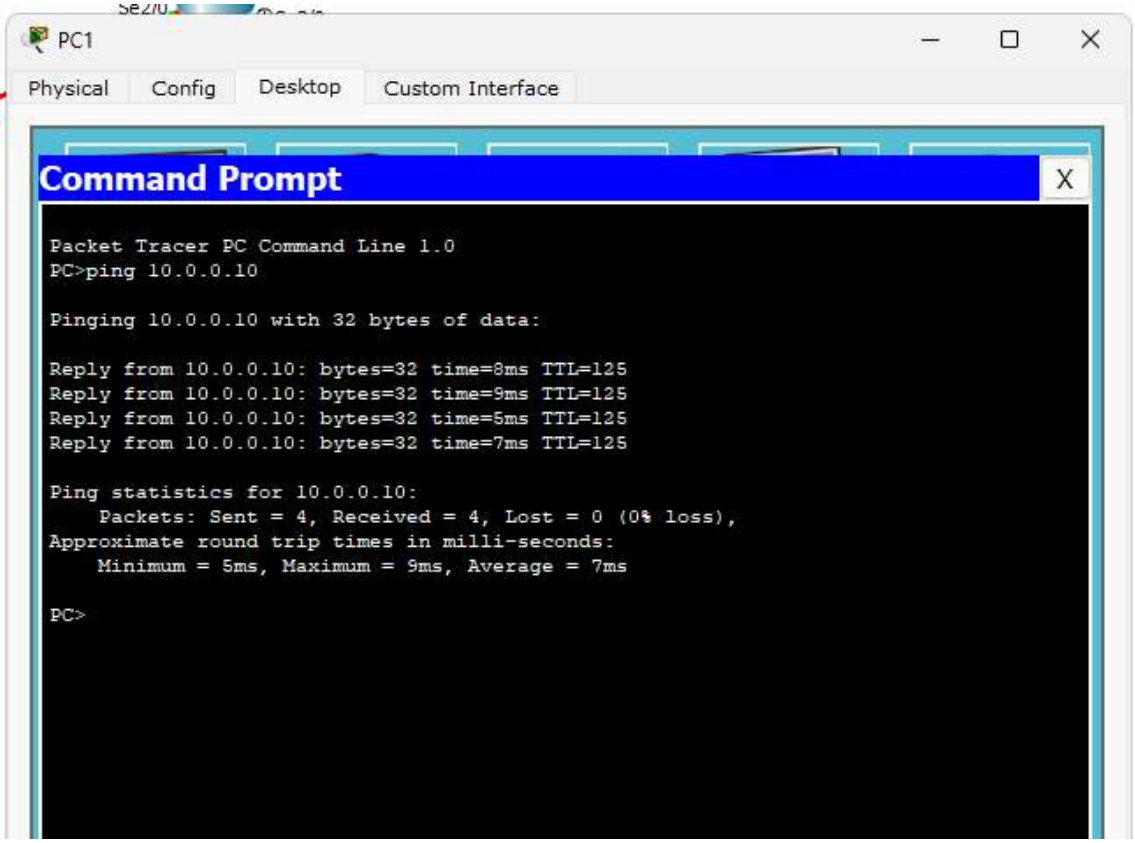

20.0.0.2
30.0.0.1
Se2/0
Se3/0
Router-PT
Router1
20.0.0.1
30.0.0.2
Se2/0
10.0.0.1
Fa0/0
Router0
Se2/0
Router-PT
Fa0/0
Router2
40.0.0.1
Fa0
Fa0
PC-PT
PC0
PC-PT
PC1
Ip: 10.0.0.10
GW: 10.0.0.1
ip: 40.0.0.10
GW: 40.0.0.1


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
```

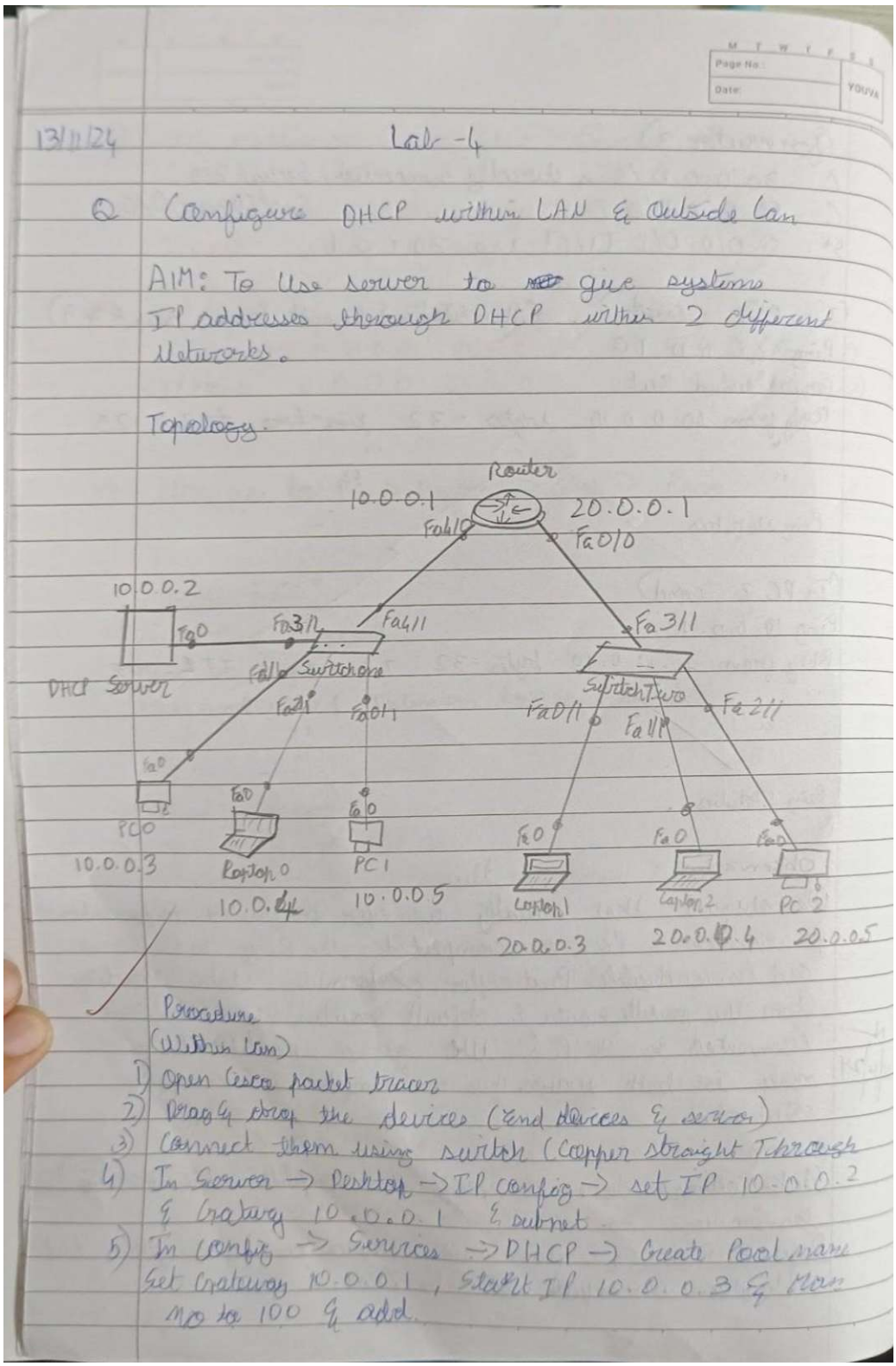
```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - 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#
```




PC1
Physical
Config
Desktop
Custom Interface
Command Prompt
X
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.



4) Go to Each end device → desktop → IP Config → Click DHCP mode → IP will be assigned.

Results:

In an end device → 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

Observation

Procedure

(Outside LAN)

1) In the previous set up add router, extra switch & few end devices.
2) Join switch & end devices through the same method as before
3) Connect both Switches to Router.
4) In Router → Cli → No → enable → config Terminal → interface Fa4/0 → ip address 10.0.0.1 255.0.0.0 → ip helper-address 10.0.0.2 → No Shut.
5) Same for Second Switch (change IP address to 20.0.0.1)
6) Go to each system → desktop → IP config → click DHCP mode → IP will be assigned (SwitchTwo).

Results

Router

show IP Route

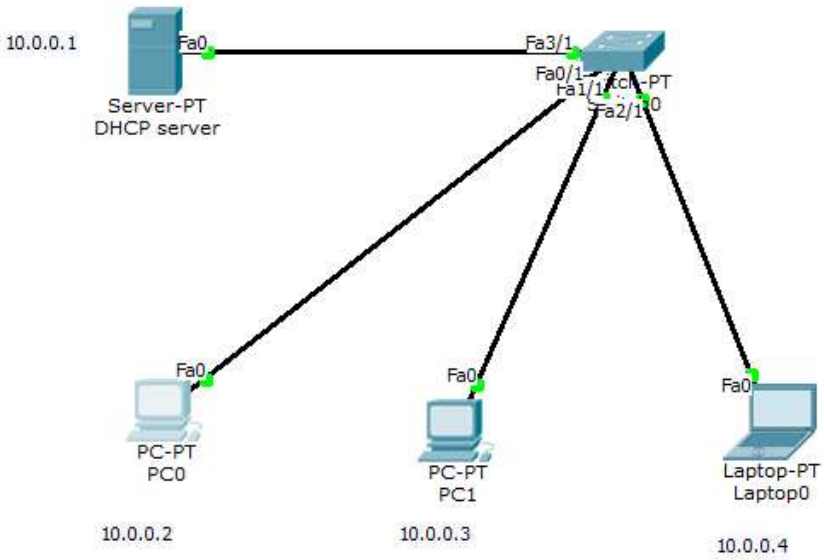
C 10.0.0.0/8 is directly Connected Fa4/0

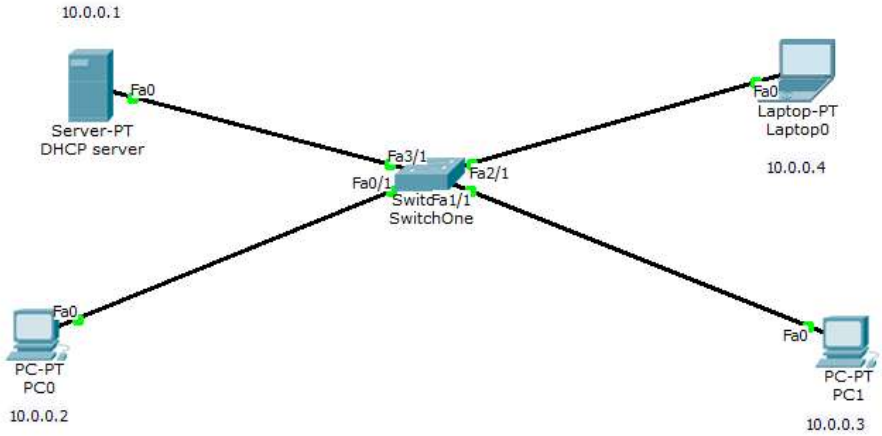
C 20.0.0.0/8 is directly Connected Fa0/0

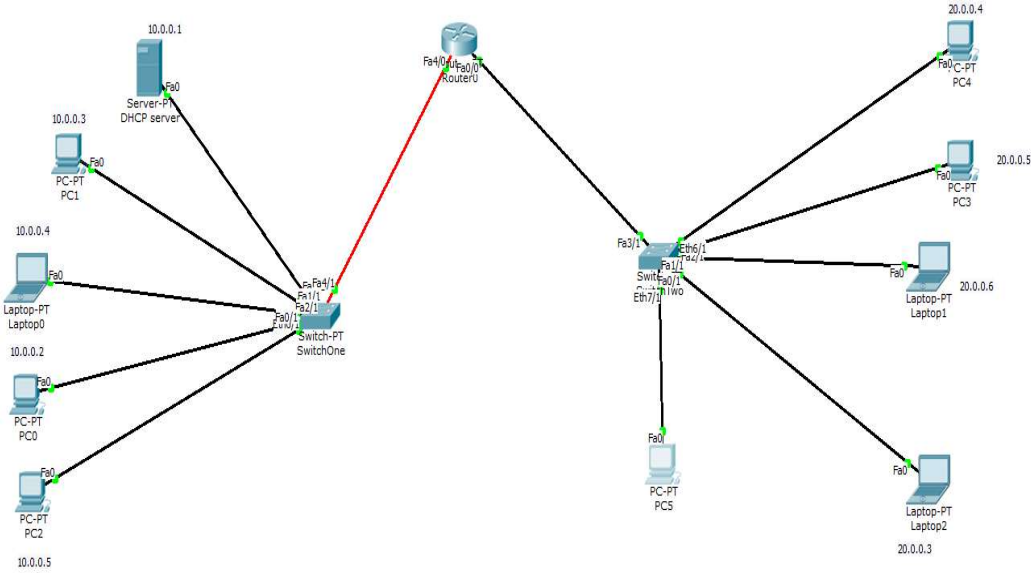
Observation

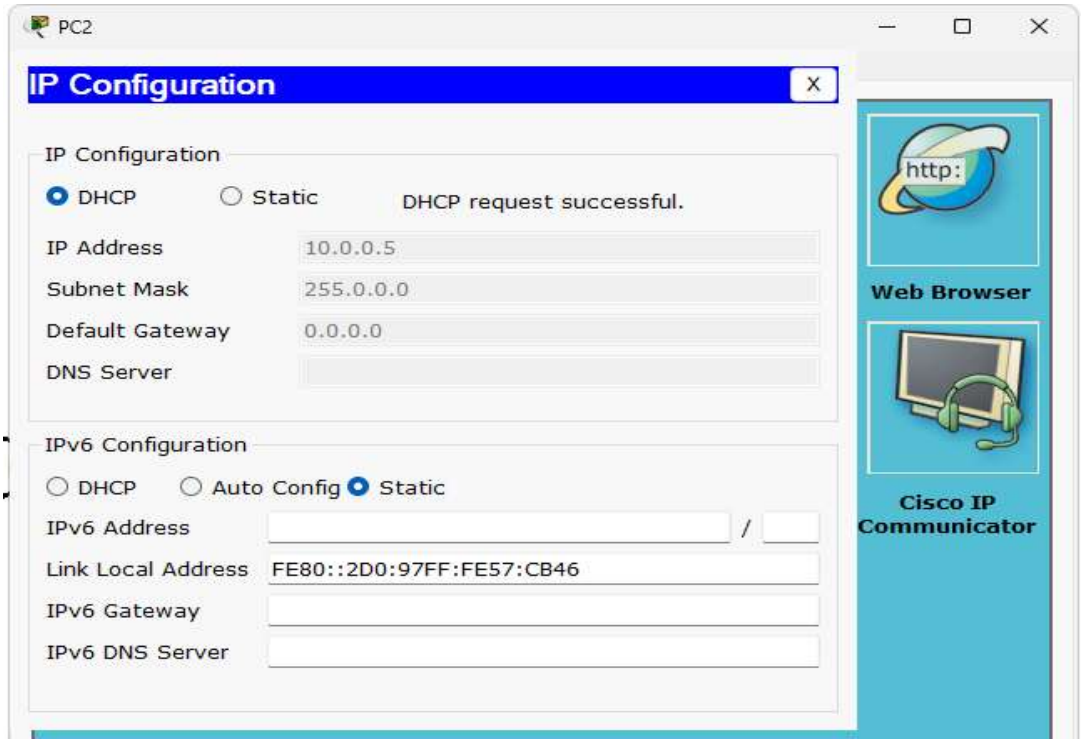
We Learn That we can use the Server to assign The IP address to any device connected to the Server within LAN or Outside the Lan through DHCP.

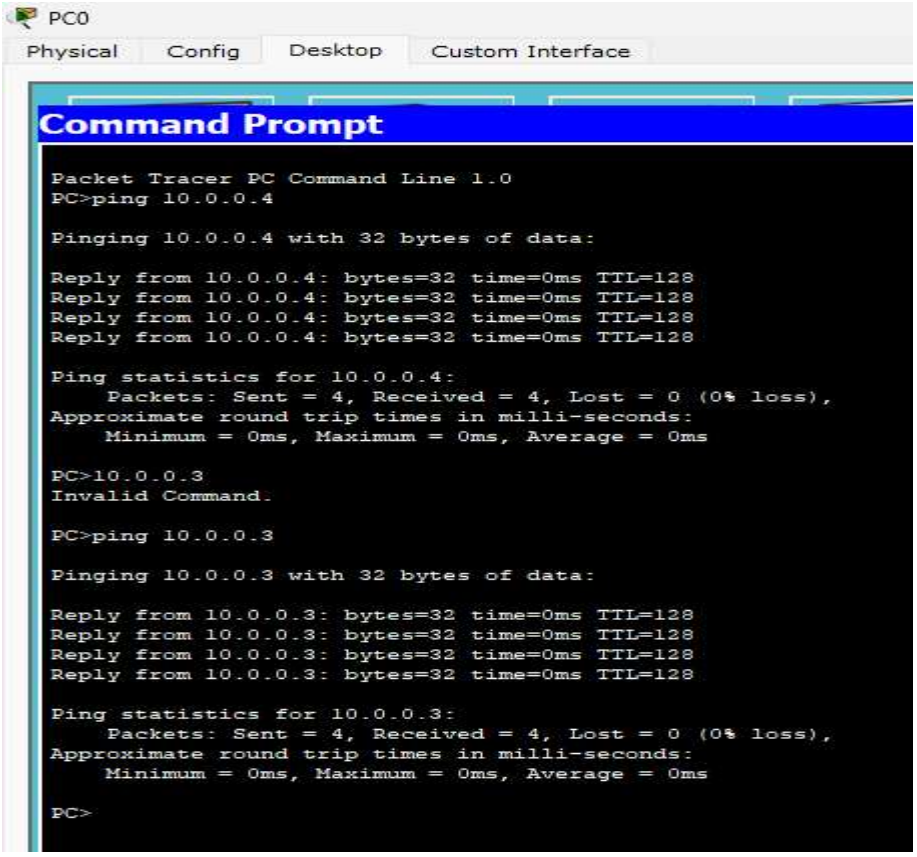
13/11/24

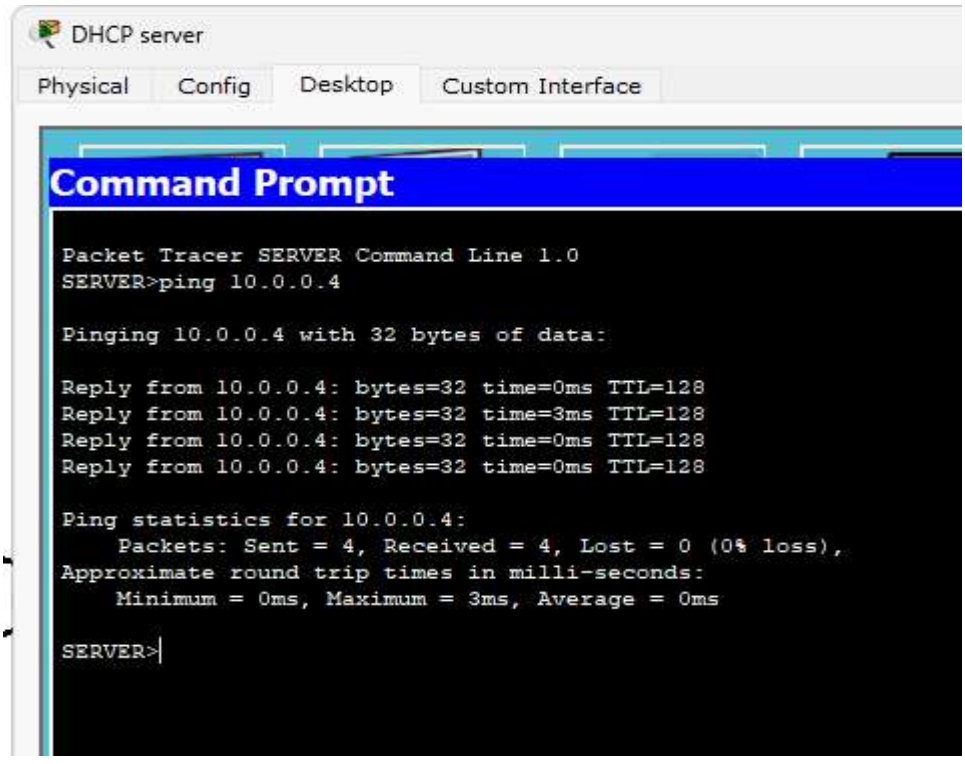

10.0.0.1
Fa0
Server-PT
DHCP server
Fa3/1
Fa0/1
Fa2/1
Fa0
PC-PT
PC0
10.0.0.2
Fa0
PC-PT
PC1
10.0.0.3
Fa0
Laptop-PT
Laptop0
10.0.0.4


10.0.0.1
Fa0
Server-PT
DHCP server
Fa3/1
Fa0/1
Fa2/1
SwitchOne
Fa0
Laptop-PT
Laptop0
10.0.0.4
Fa0
PC-PT
PC0
10.0.0.2
Fa0
PC-PT
PC1
10.0.0.3

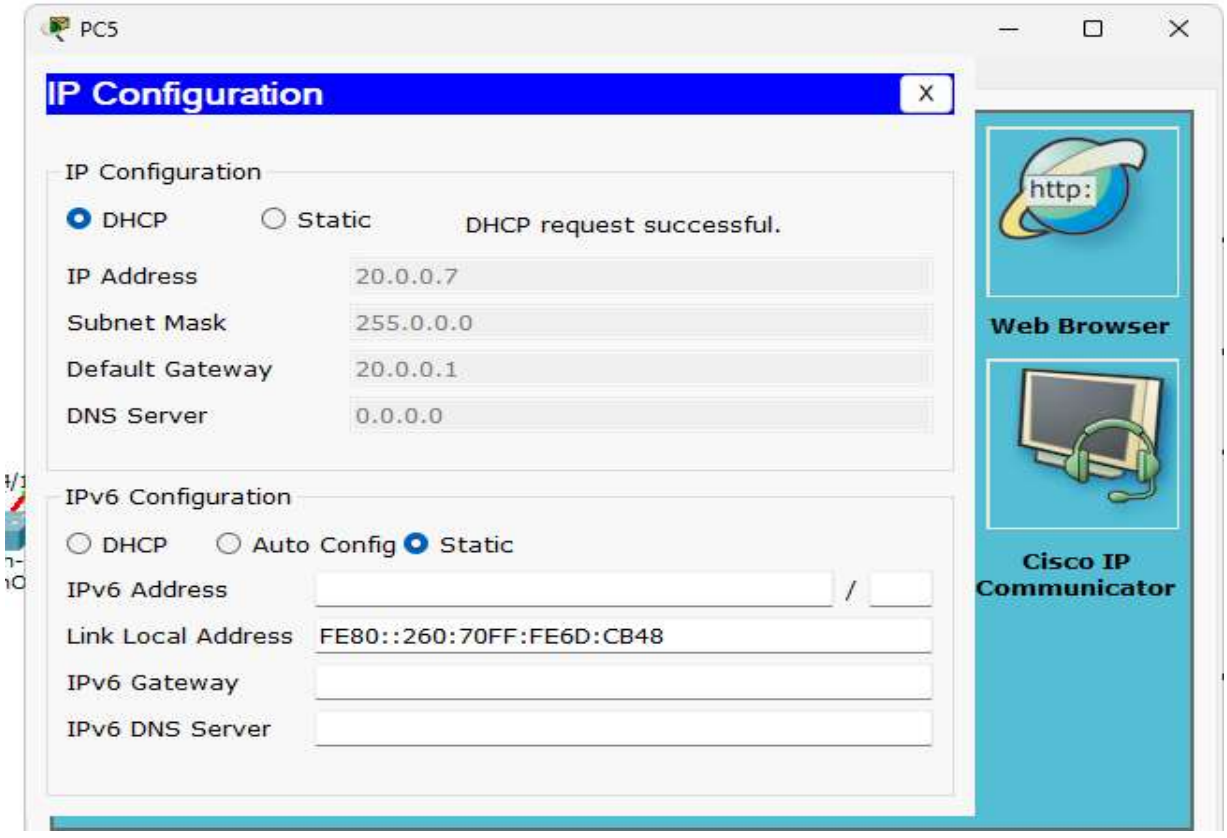

10.0.0.1
Server-PT
DHCP server
10.0.0.3
PC-PT
PC1
10.0.0.4
Laptop-PT
Laptop0
10.0.0.2
PC-PT
PC0
PC-PT
PC2
10.0.0.5
Switch-PT
SwitchOne
Router0
20.0.0.4
C-PT
PC4
20.0.0.5
PC-PT
PC3
20.0.0.6
Laptop-PT
Laptop1
PC-PT
PC5
Laptop-PT
Laptop2
20.0.0.3


PC2
IP Configuration
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
10.0.0.5
Subnet Mask
255.0.0.0
Default Gateway
0.0.0.0
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2D0:97FF:FE57:CB46
IPv6 Gateway
IPv6 DNS Server
http:
Web Browser
Cisco IP
Communicator


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
Reply from 10.0.0.4: bytes=32 time=0ms 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 = 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
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
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>

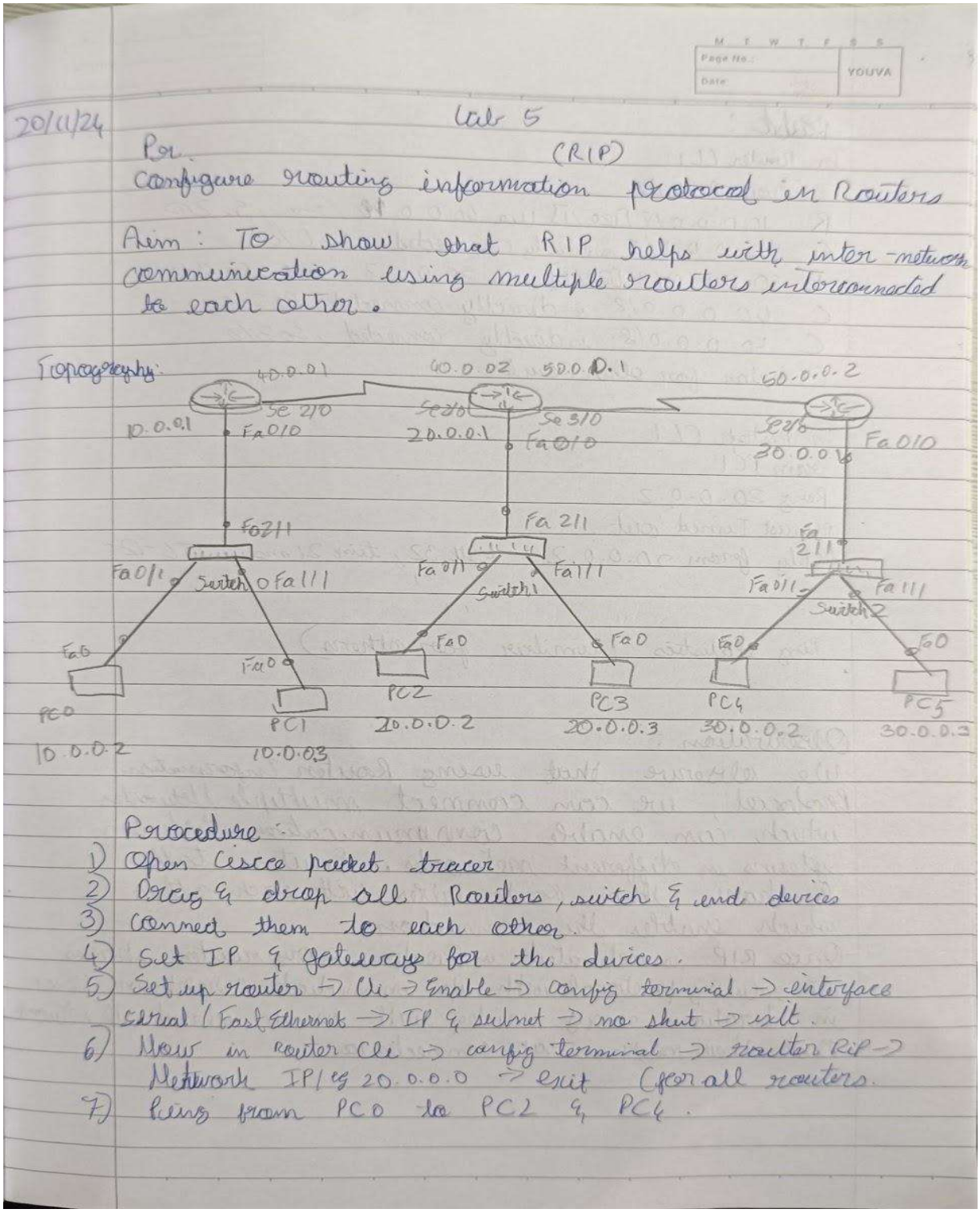

DHCP server
Physical
Config
Desktop
Custom Interface
Command Prompt
Packet Tracer SERVER Command Line 1.0
SERVER>ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=3ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
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 t
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 t
o up

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



LABORATORY PROGRAM – 5

Configure RIP routing Protocol in Routers



Result:

In Router CLI

→ Show IP Route

R 10.0.0.0/8 [120/1] via 40.0.0.[illegible], time, Se 2/0

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

R 30.0.0.0/8 [120/1] 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 Pc1 of CLI

From PC1

Ping 20.0.0.2

Request Timed out.

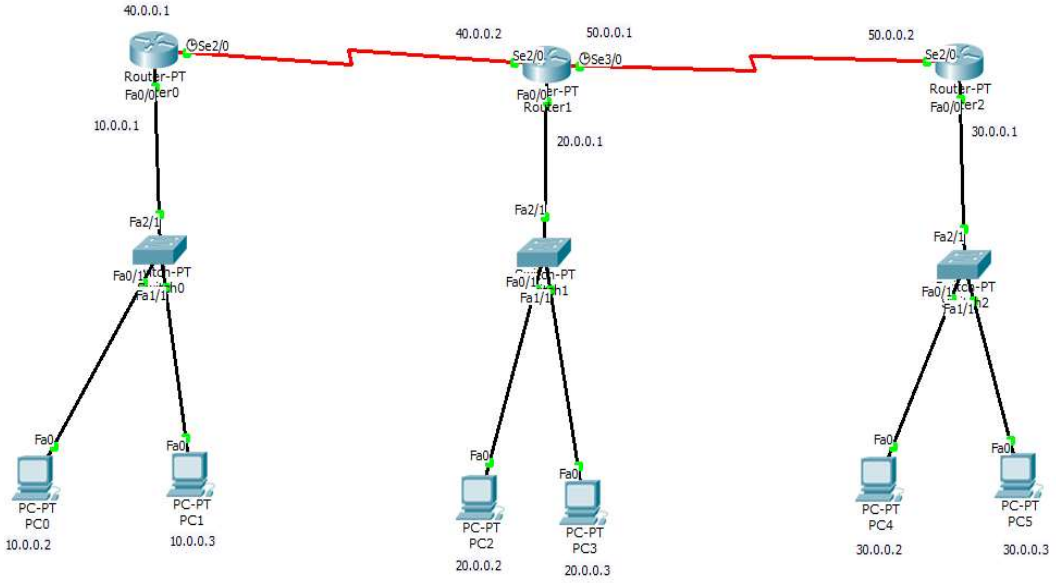
Reply from 20.0.0.2 : bytes 32, time 21 ms, TTL=126

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.

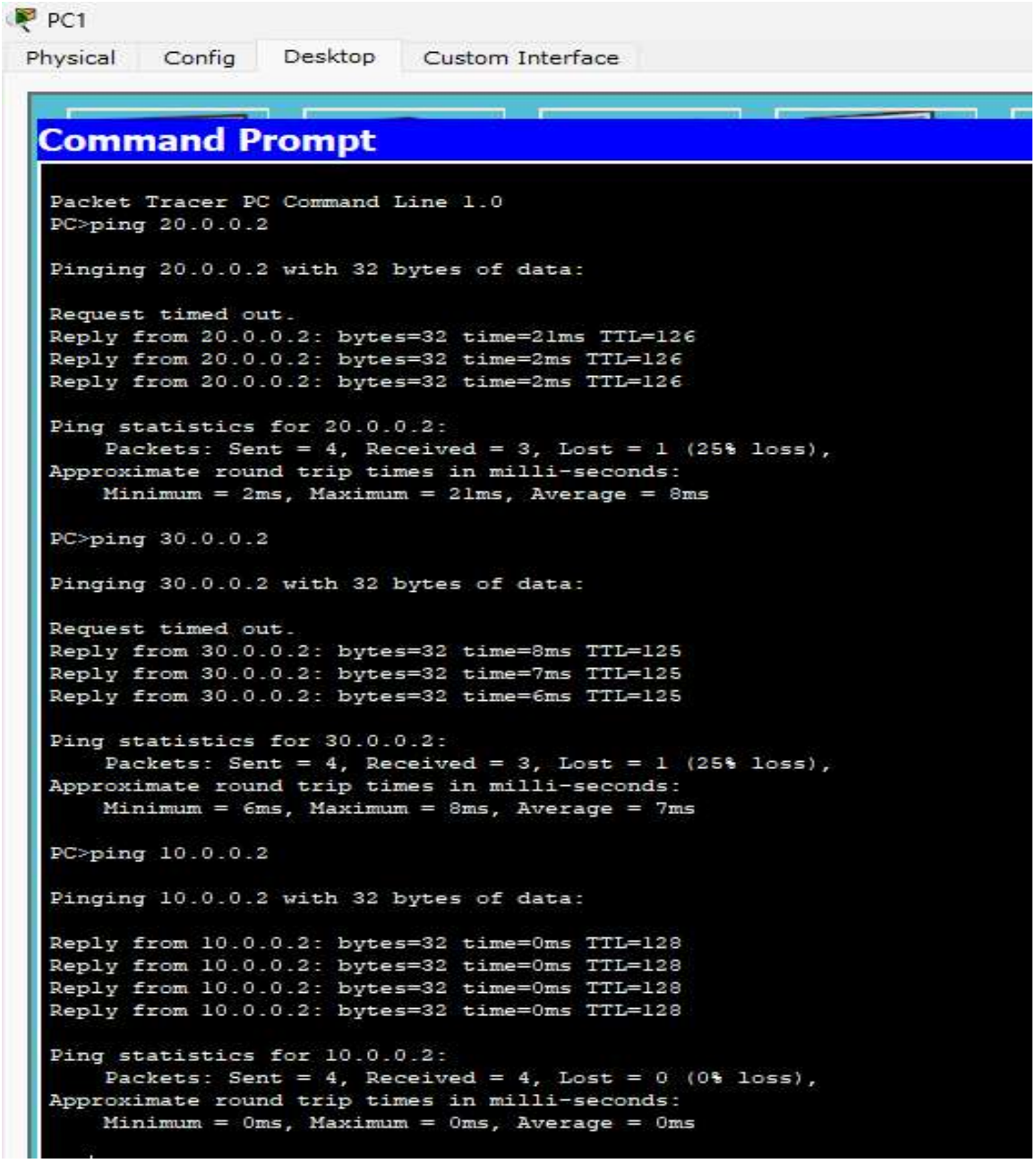
-Once RIP is activated in Router, every router shares its routing protocol with its immediate neighbours, Hence in iterations every router will know about all network that their neighbour are connected to.

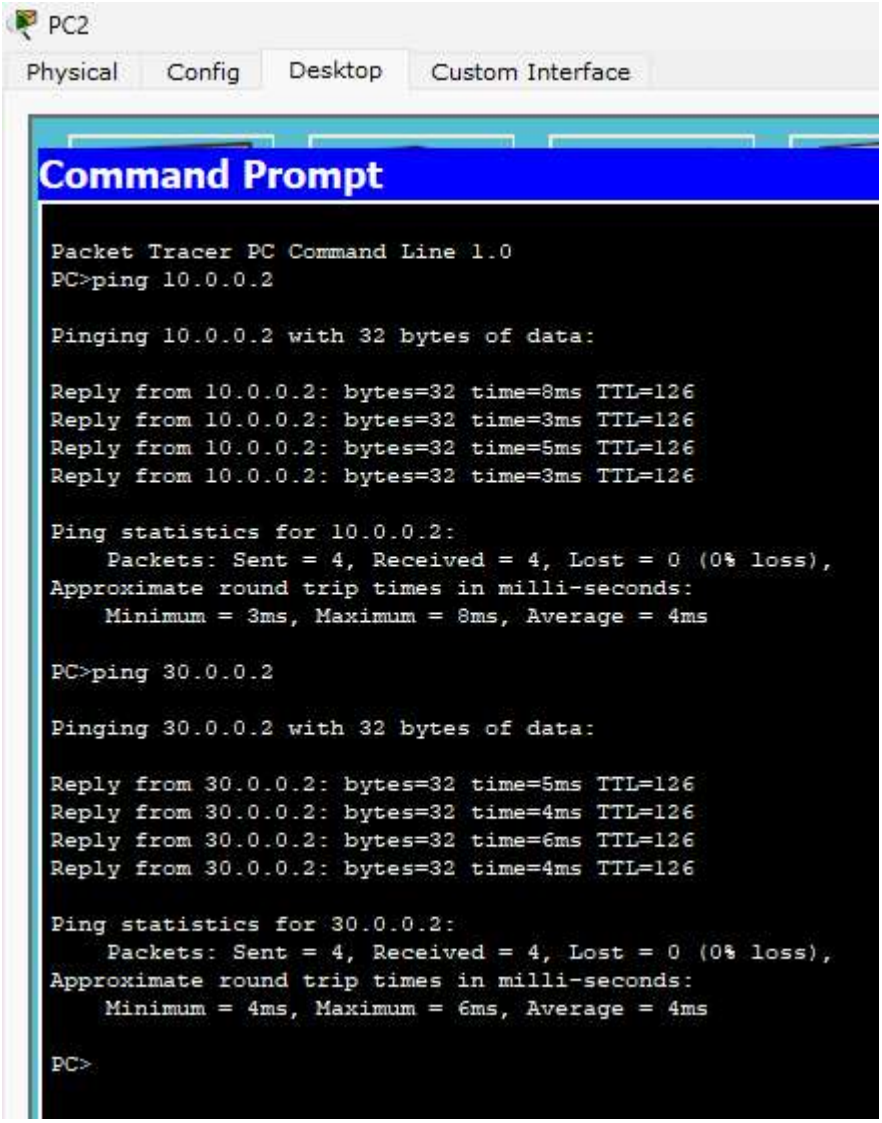


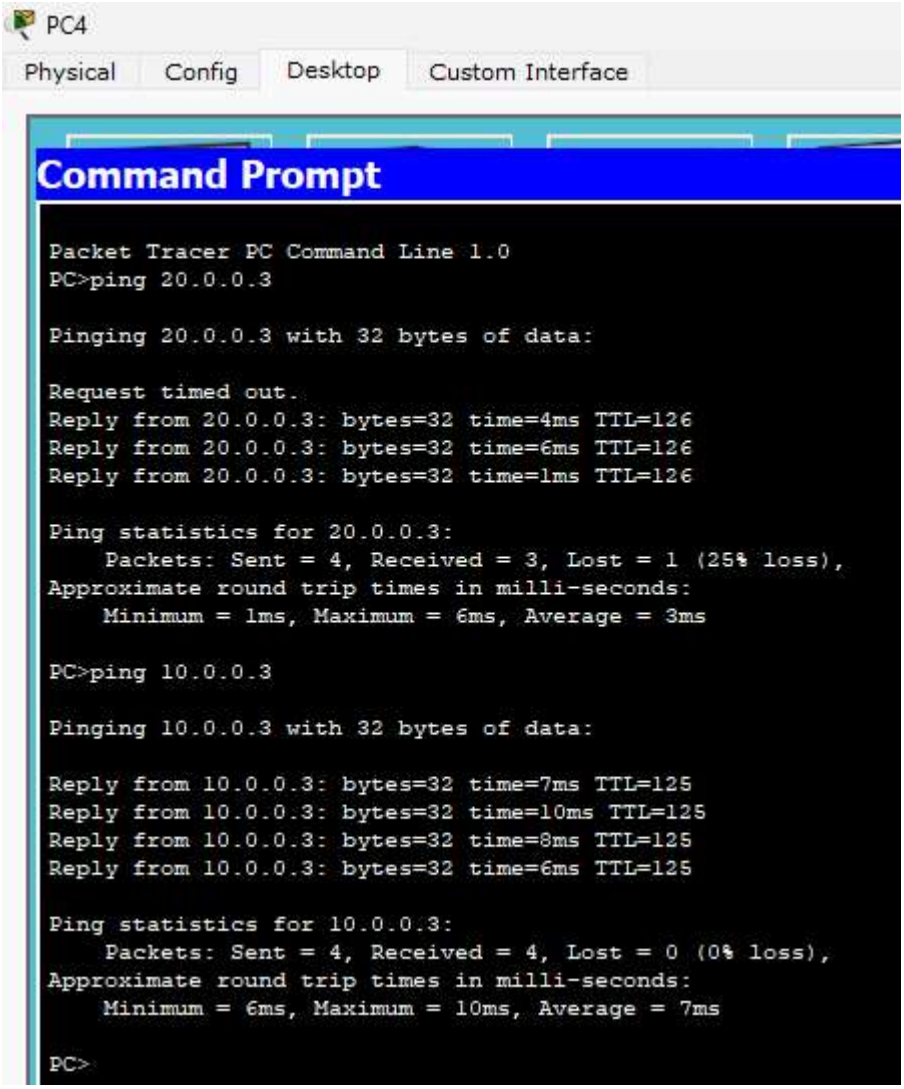

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%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

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

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
Router#
```

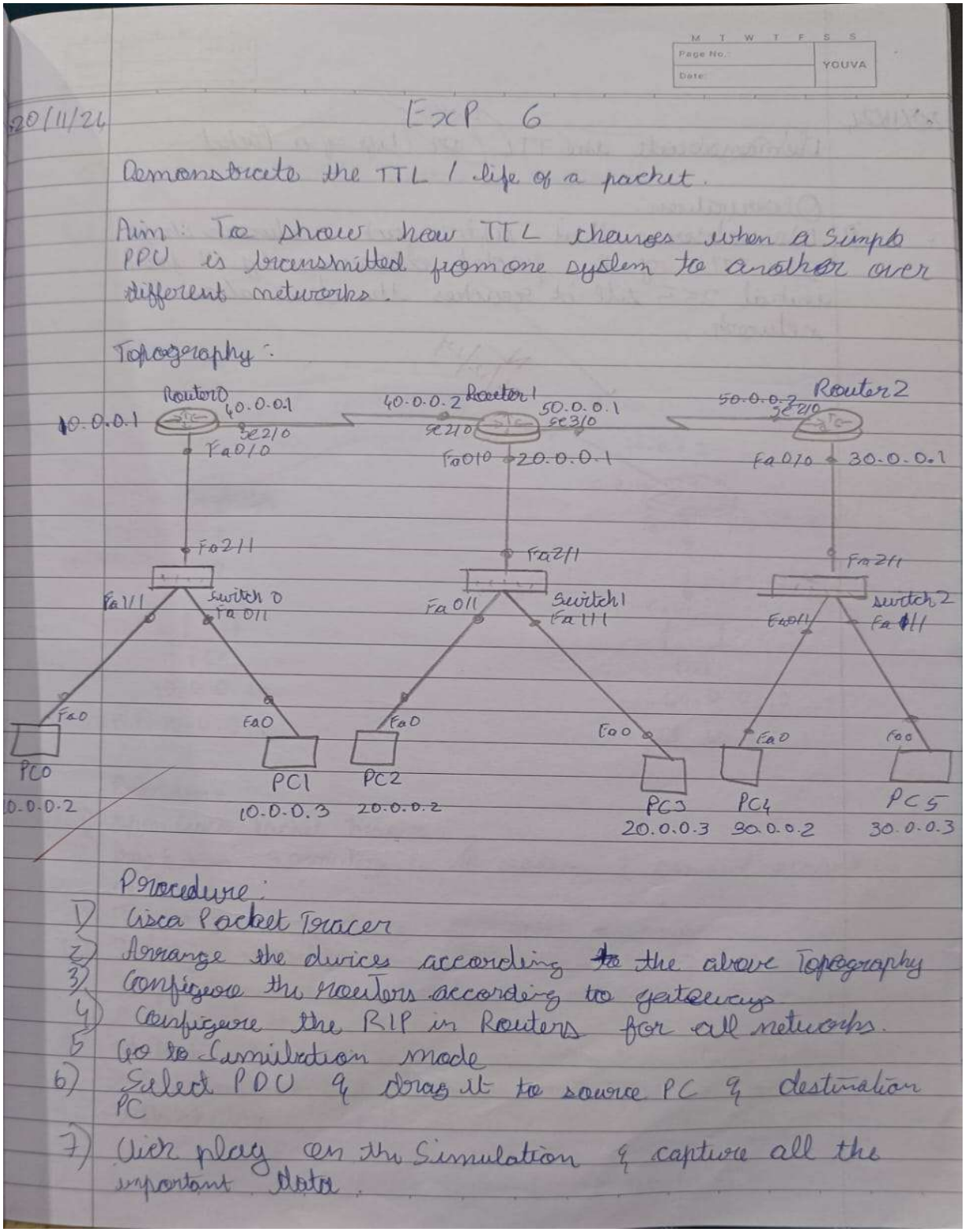

PC1
Physical
Config
Desktop
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.2
Pinging 20.0.0.2 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.2: bytes=32 time=21ms TTL=126
Reply from 20.0.0.2: bytes=32 time=2ms TTL=126
Reply from 20.0.0.2: bytes=32 time=2ms 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
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
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.



20/11/24

Exp 6

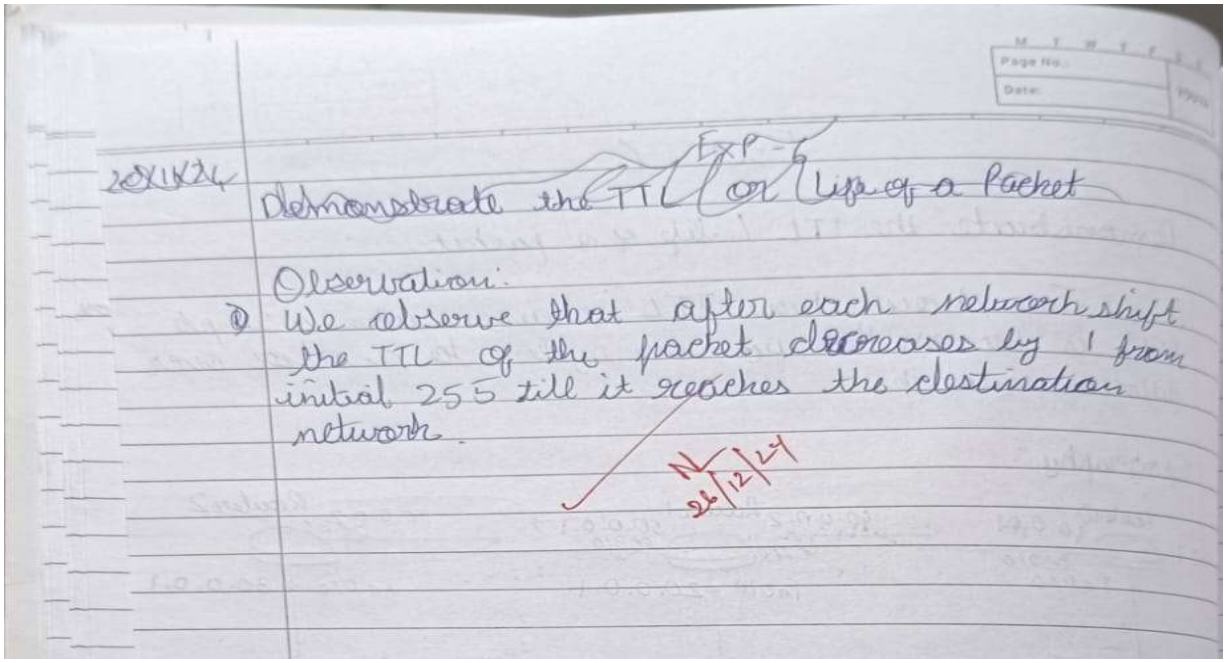
Demonstrate the TTL / life of a packet.

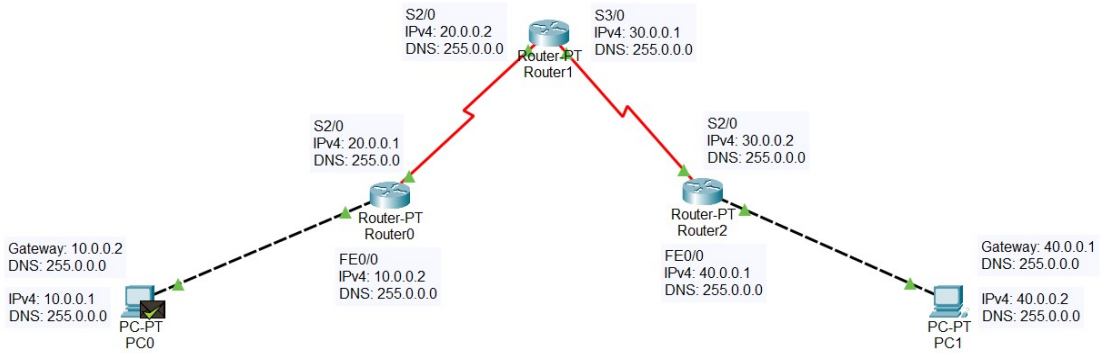
Aim: To show how TTL changes when a simple PDU is transmitted from one system to another over different networks.

Topography:

Procedure:

1) Cisco Packet Tracer
2) Arrange the devices according to the above Topography
3) Configure the routers according to gateways
4) Configure the RIP in Routers for all networks.
5) Go to Simulation mode
6) Select PDU & drag it to source PC & destination PC
7) Click play on the Simulation & capture all the important data.





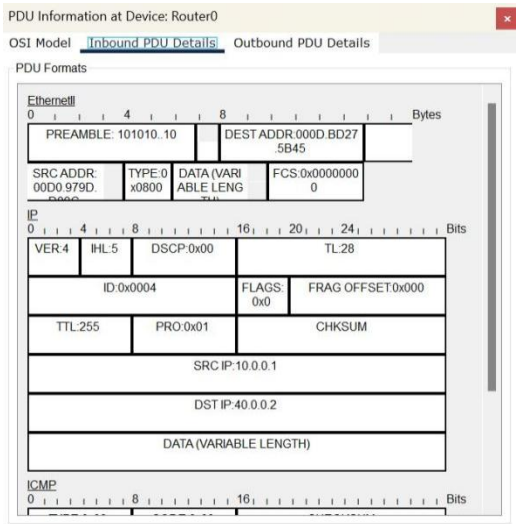


Figure 6.1: Inbound PDU, Router0

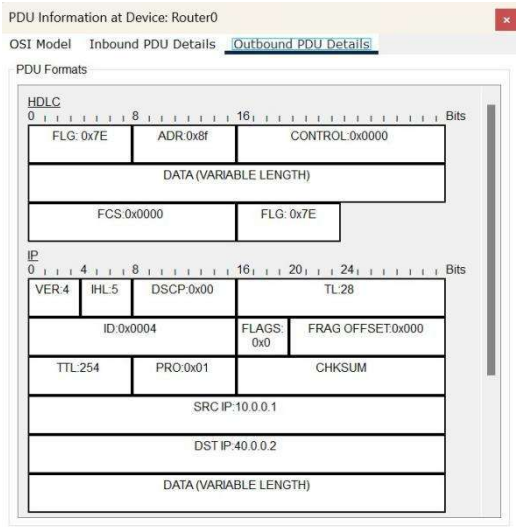


Figure 6.2: Outbound PDU, Router0

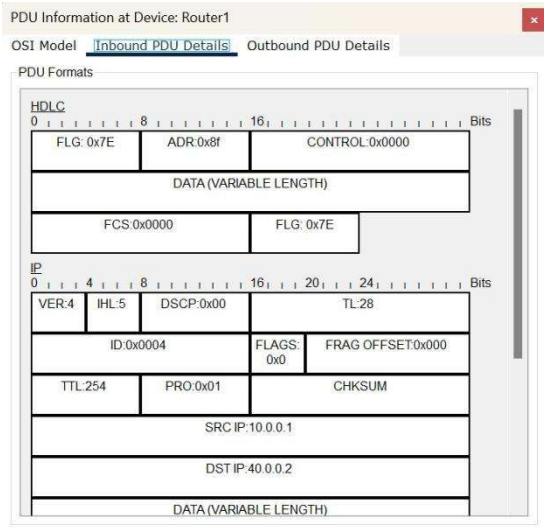


Figure 6.3: Inbound PDU, Router1

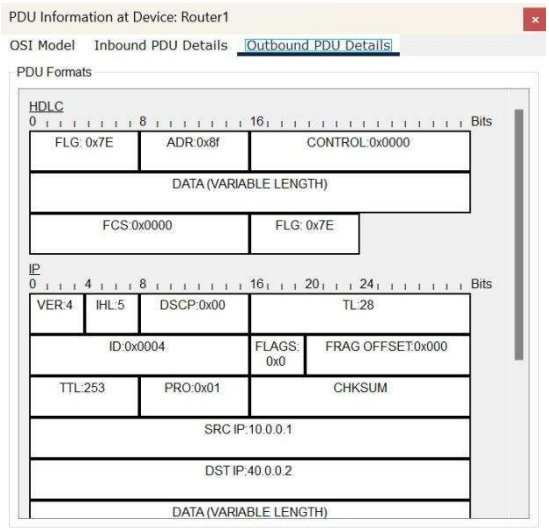


Figure 6.4: Outbound PDU, Router1

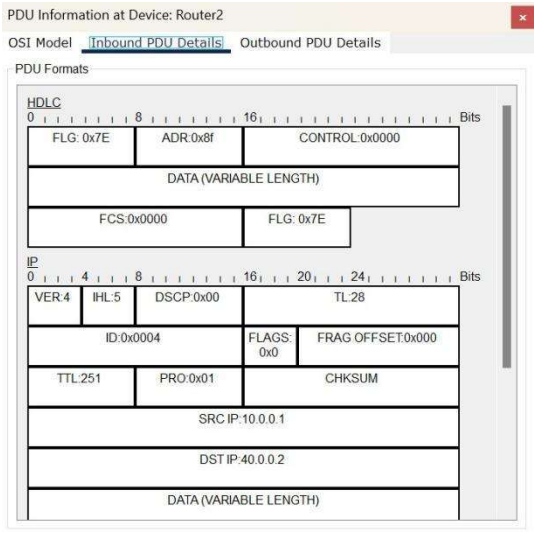


Figure 6.5: Inbound PDU, Router2

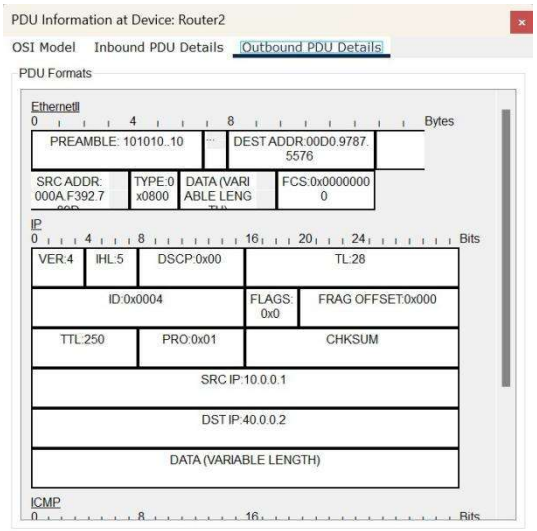


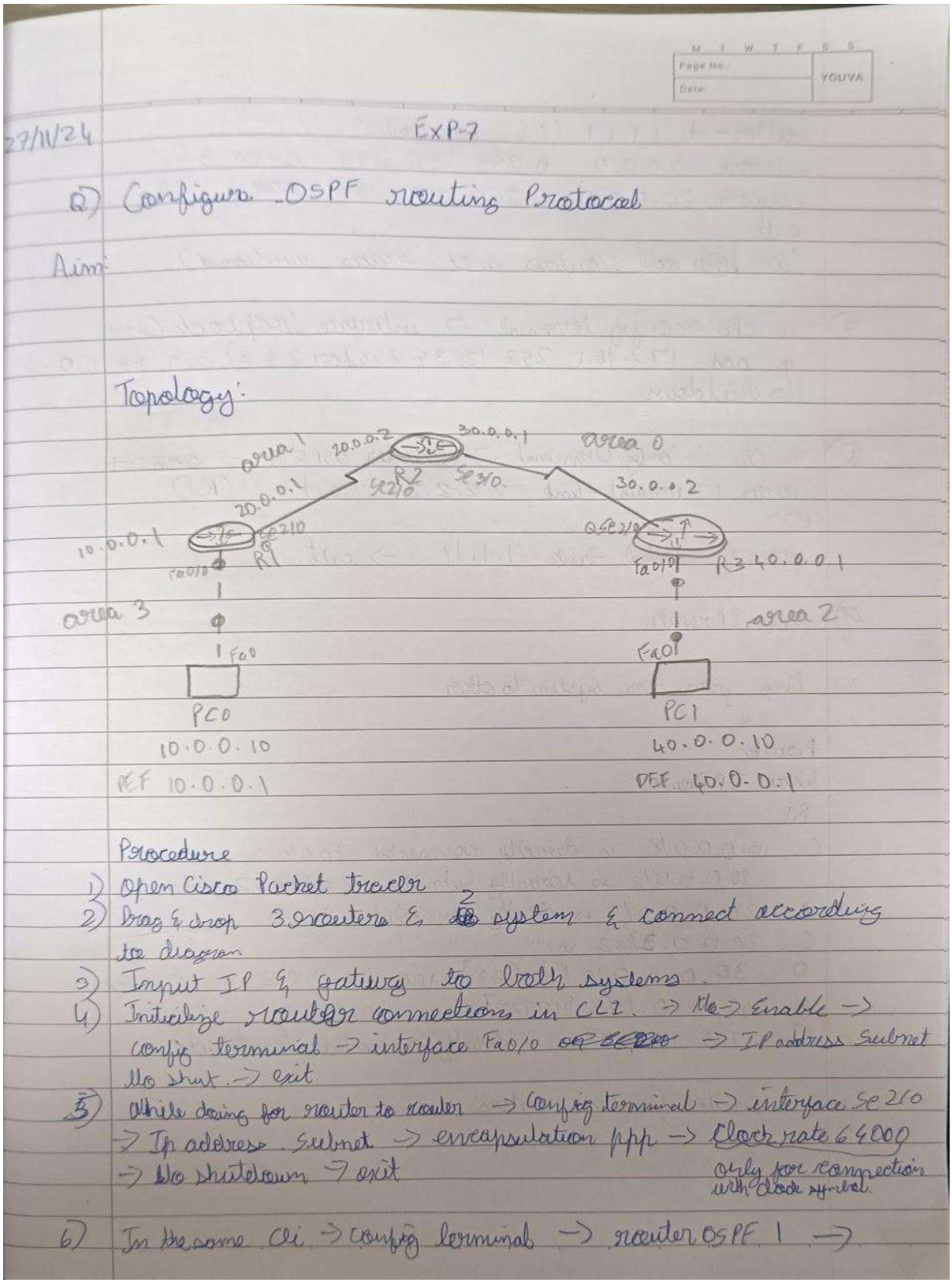
Figure 6.6: Outbound PDU, Router2

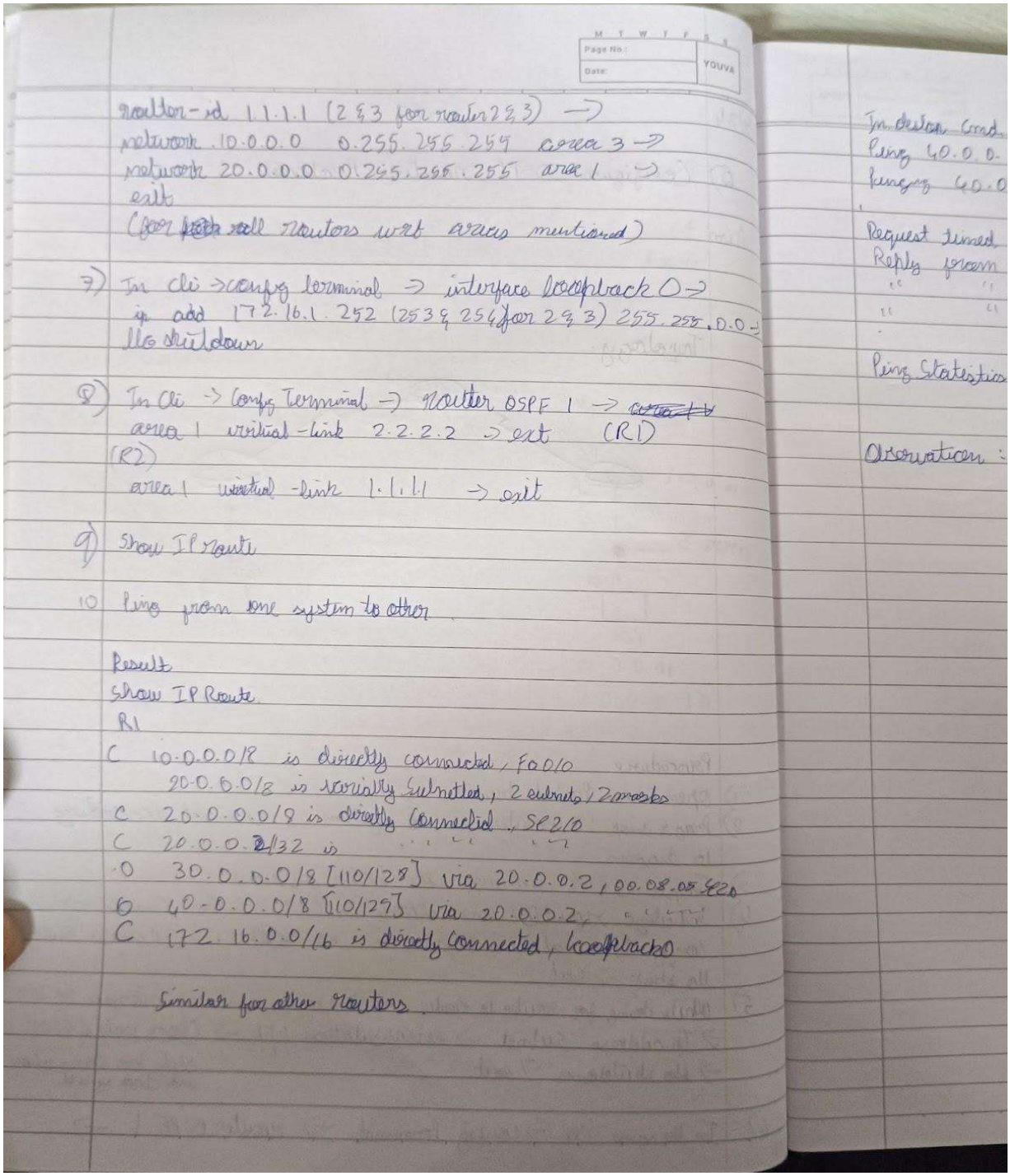
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	

```
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





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 all routers with 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 → exit (R1)
(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, Fa0/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Se2/0
C 20.0.0.2/32 is
O 30.0.0.0/8 [110/128] via 20.0.0.2, 00:08:05, Se2/0
O 40.0.0.0/8 [110/129] via 20.0.0.2,
C 172.16.0.0/16 is directly connected, Loopback0

Similar for other routers.

In device Cmd.
Ping 40.0.0.
Ping 40.0

Request timed
Reply from

Ping Statistics

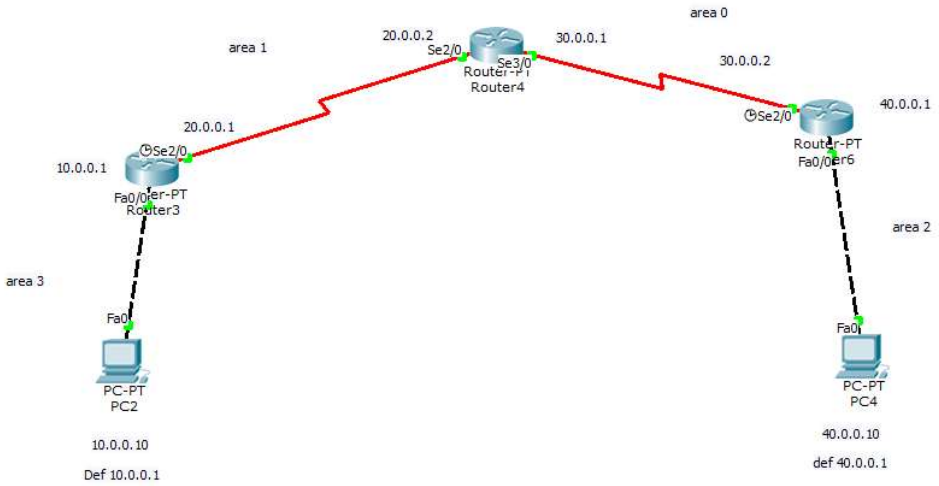
Observation :

In destop 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

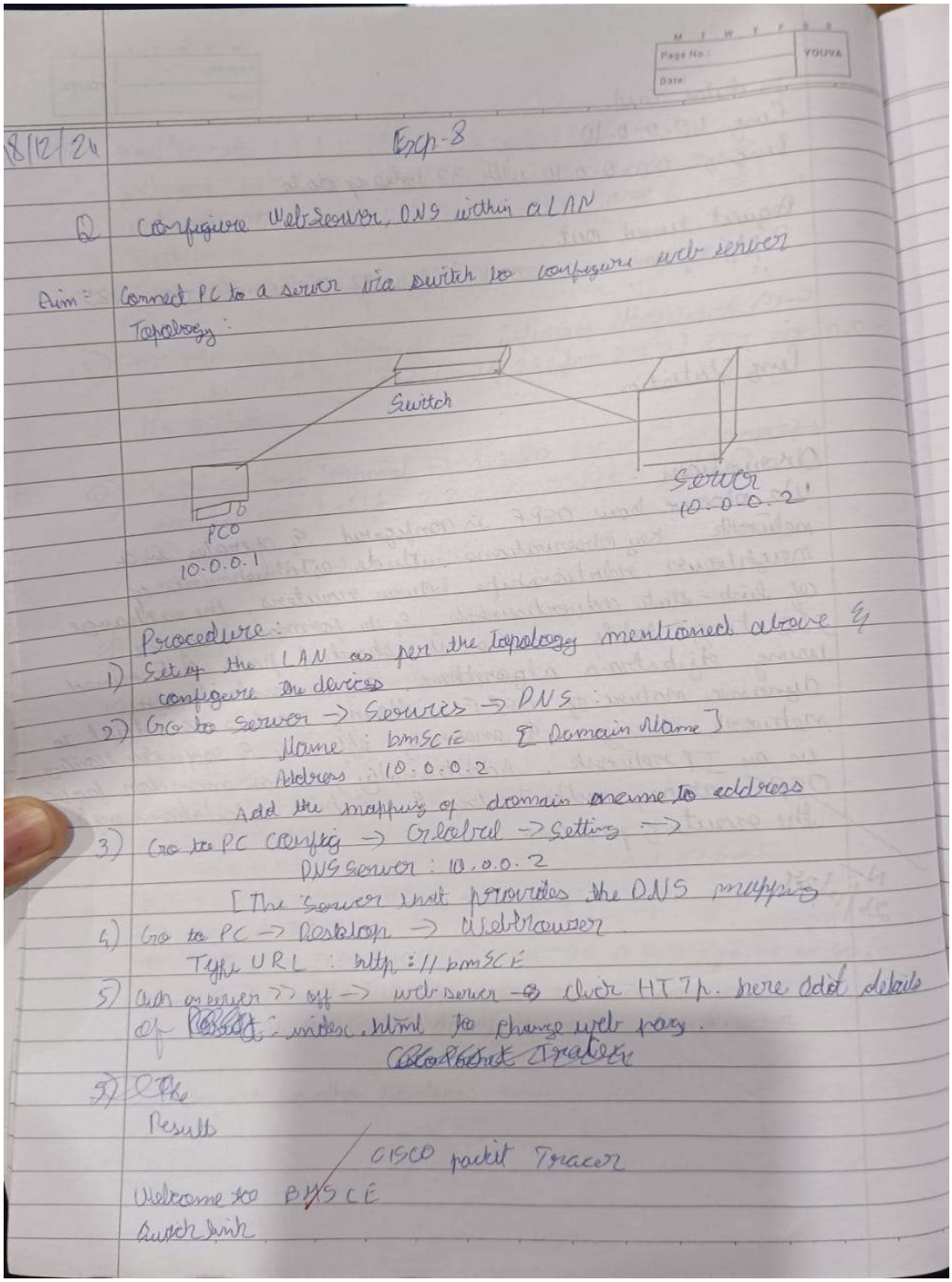
```
Router#
%SYS-5-CONFIG_I: Configured from console by console

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
```

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.

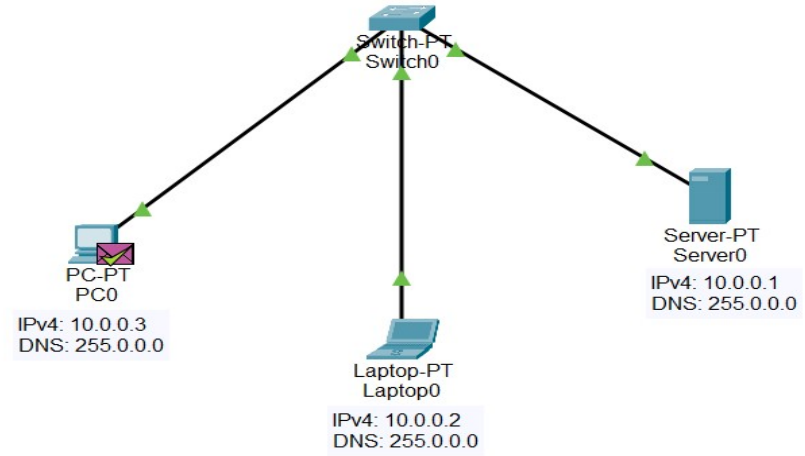
1] The web pages hosted by the server were visible on the browser

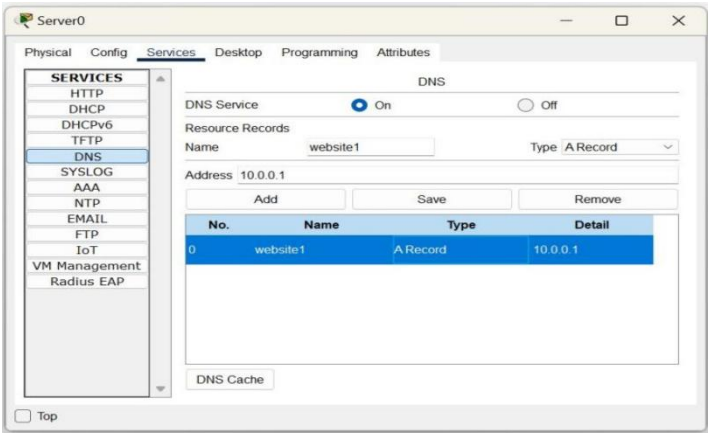
2] The DNS was successful in mapping the domain name to the IP address

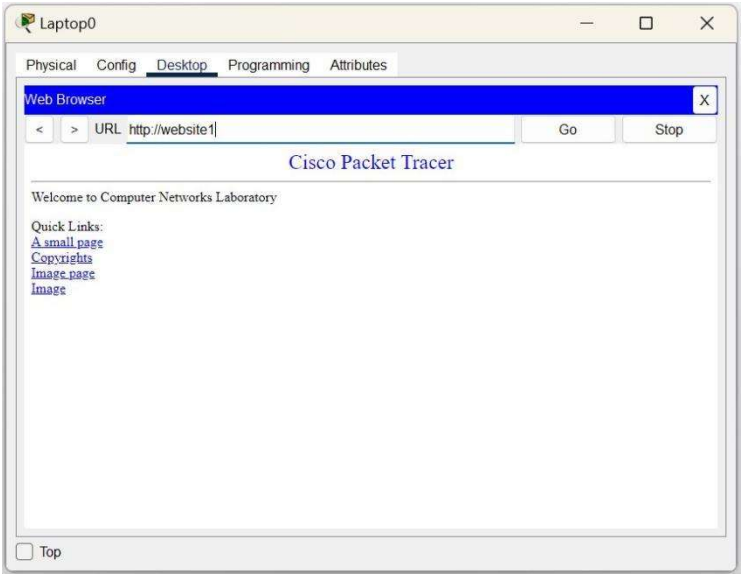
3] DNS server is a server that contains a domain name : IP address mapping to which the end devices send requests to map the name to IP address

4] Index.html can be edited to give personalized website details to be displayed.

26/12/24

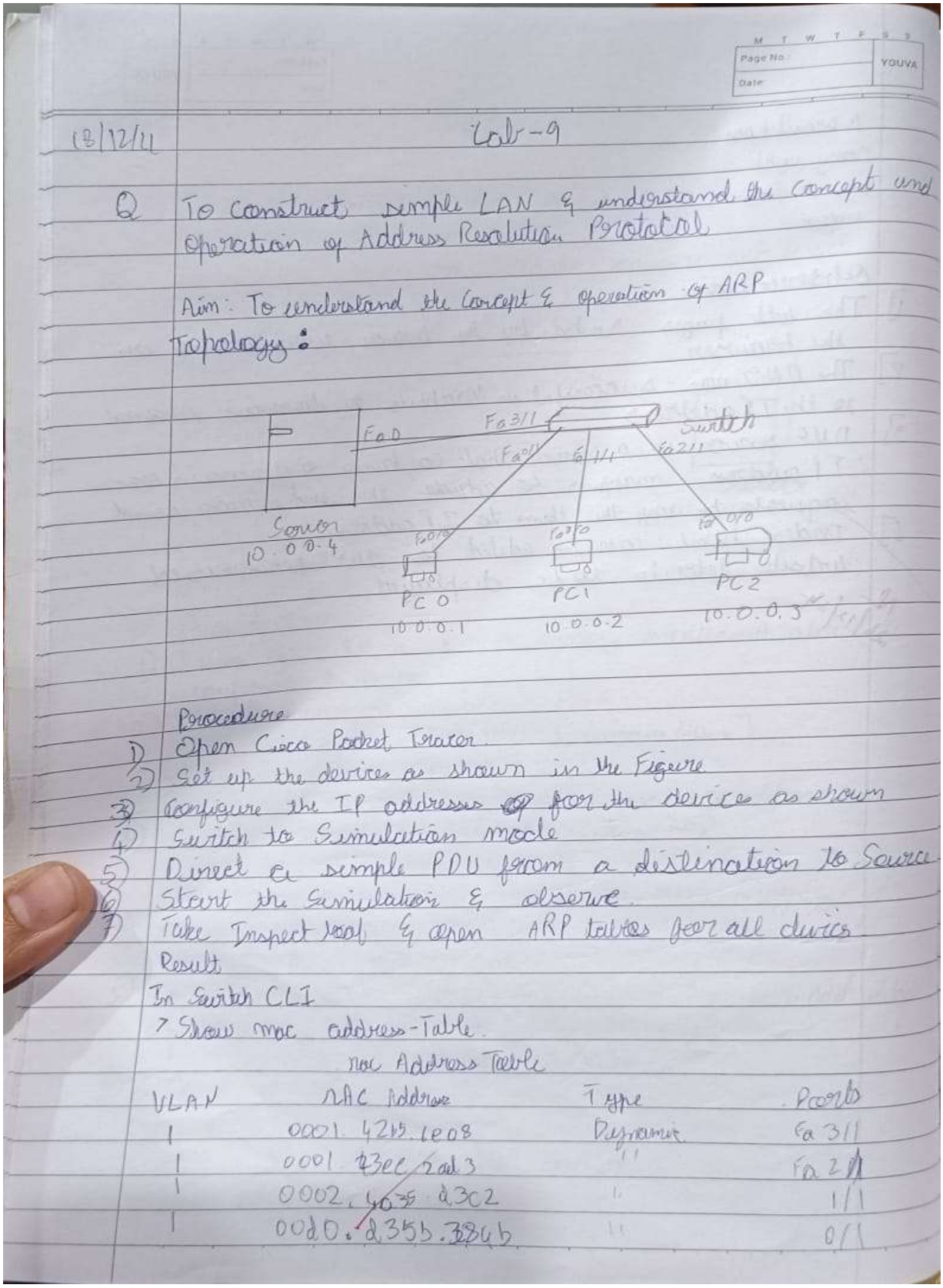





Laptop0
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://website1
Go
Stop
Cisco Packet Tracer
Welcome to Computer Networks Laboratory
Quick Links:
A small page
Copyrights
Image page
Image
Top

LABORATORY PROGRAM – 9

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



13/12/21

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	0001.42B5.1E08	Dynamic	Fa3/1
1	0001.43EC.5AB3	"	Fa2/1
1	0002.4A3B.B302	"	1/1
1	00D0.D355.3B4B	"	0/1

Initially ARP tables Empty

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

PC1 — Src

IP	Hardware	Interface
10.0.0.3	0001.43CC.2AD3	FA0

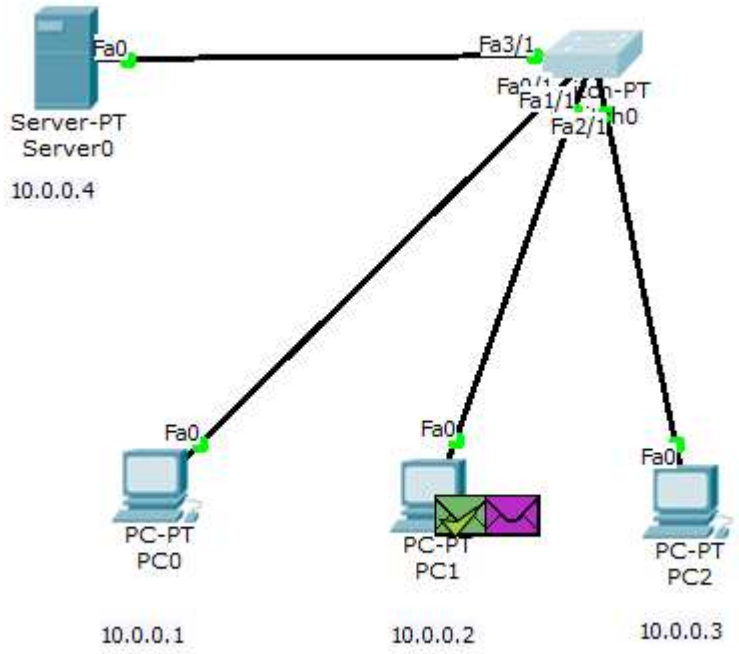
PC2 — Dst

IP	Hardware	Interface
10.0.0.2	0002.4A35.D3C2	FA0

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 tables 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.

26/12/24



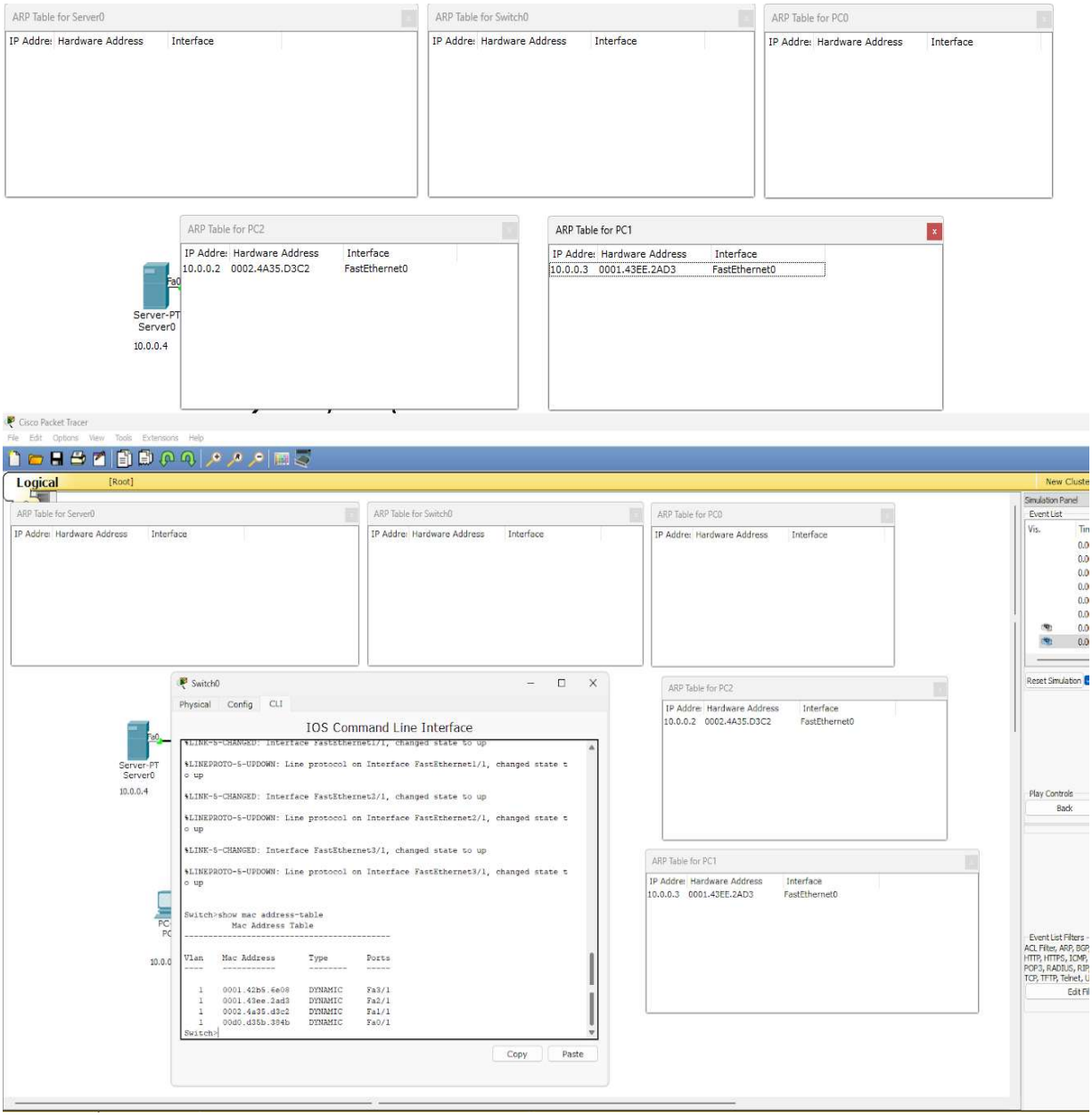
Switch0

Physical Config CLI

IOS Command Line Interface

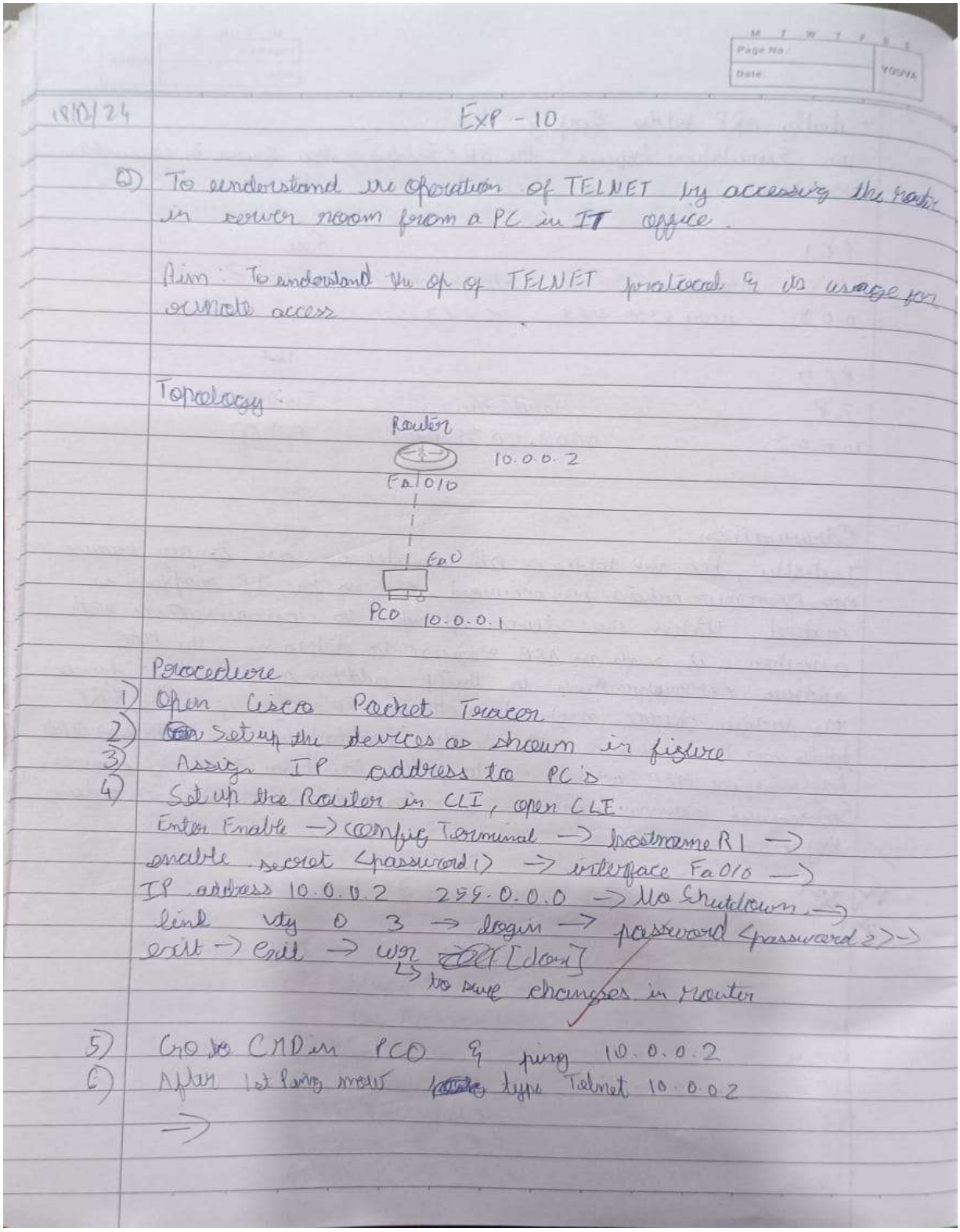
```
%LINK-5-CHANGED: Interface FastEthernet1/1, changed state to up

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

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

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

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

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


ARP Table for Server0
IP Addre: Hardware Address Interface
ARP Table for Switch0
IP Addre: Hardware Address Interface
ARP Table for PC0
IP Addre: Hardware Address Interface
ARP Table for PC2
IP Addre: Hardware Address Interface
10.0.0.2 0002.4A35.D3C2 FastEthernet0
ARP Table for PC1
IP Addre: Hardware Address Interface
10.0.0.3 0001.43EE.2AD3 FastEthernet0
Server-PT Server0
10.0.0.4
Cisco Packet Tracer
Logical
[Root]
Switch0
Physical
Config
CLI
IOS Command Line Interface
%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
Simulation Panel
Event List
Reset Simulation
Play Controls
Back

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:

Procedure

1) Open Cisco Packet Tracer
2) Setup 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 → line vty 0 3 → login → password <password> → exit → Exit → wr [down]
↳ to save changes in Router
5) Go to CMD in PC0 & ping 10.0.0.2
6) After 1st ping now type Telnet 10.0.0.2

→

Page No.
Date
YOUVA

Results:

[Ping]

Pinging 10.0.0.2 with 32 bytes of data:

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

Ping statistics

[Telnet]

Trying 10.0.0.2 ... open

User access Verification

<Enter Password:>

R1> enable

~~R1(config)# ip route~~

Password: <Password>

R1# show IP route

Codes:

Gateway of last resort is not set.

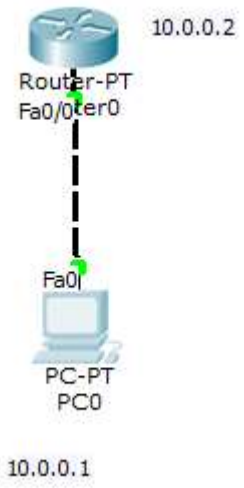
C 10.0.0.0/8 is directly connected, Fa 0/0

R1#

Observation:

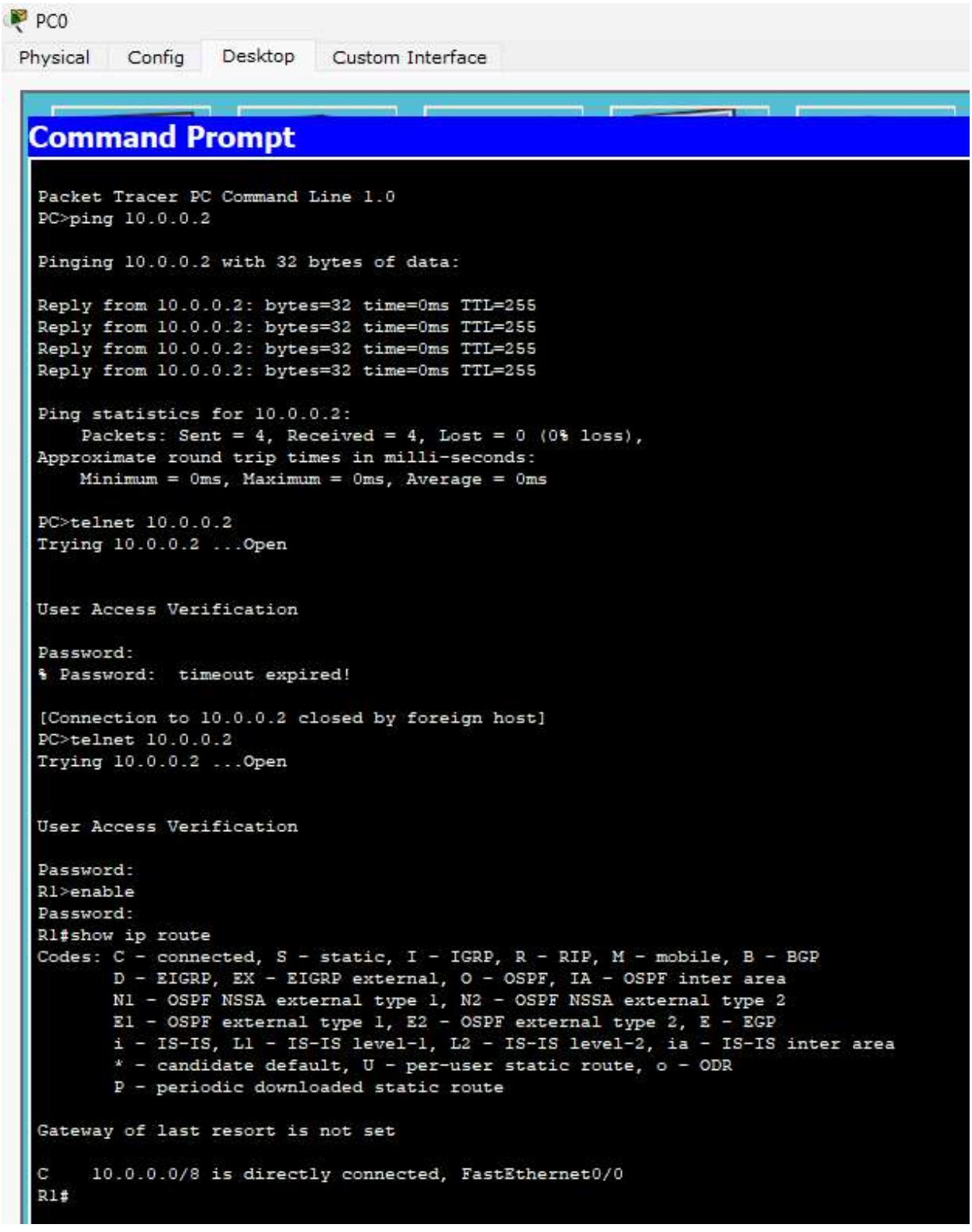
Telnet is a text based protocol that enables remote communication over TCP/IP networks. It allows the execution of commands on a remote device, often used for initial setup or management. In the experiment above, we see that all configurations & commands executed via Telnet mirrored those done directly on the router but from the PC interface instead. Only Disadvantage is that Telnet lacks encryption, making it less secure compared to SSH.

26/12/24




```
         --- 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 t
o 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
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
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

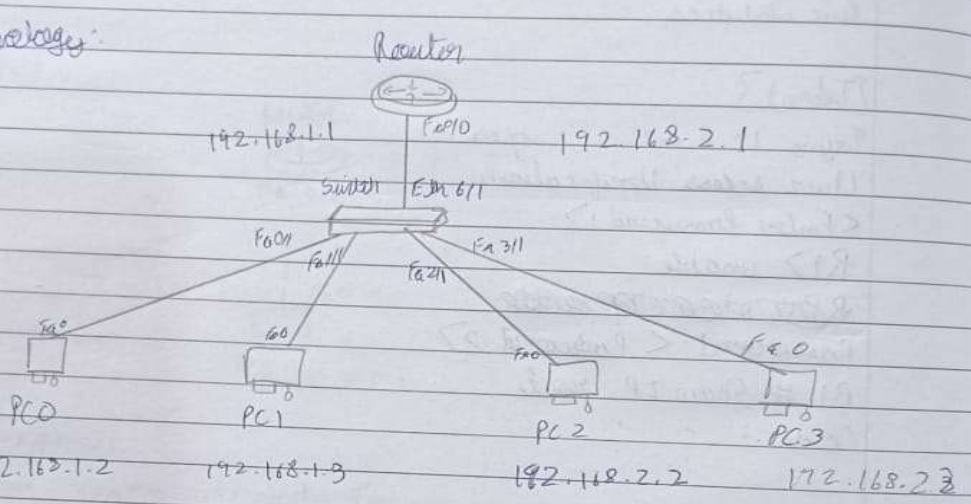
18/12/24

Exp -11

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

Aim: To construct a VLAN & understand the function.

Topology:



Procedure

1) Open Cisco packet Tracer
2) Setup the connections between the devices as shown. Choose 1841
3) Set IP & gateway addresses to all PC's
4) Set up router for one gateways
   enable → config Terminal → interface fa0/0 → IP address 192.168.1.1 255.255.255.0 → No shut → exit
5) Go to Switch config → select VLAN database create a new VLAN (VLAN number 2, VLAN name: CSE ISE) & add
6) Go to interface ethernet 0/1 → switch to trunk
7) Go to Fa2/1 Access & VLAN (Enter VLAN number)
8) Go to Router CLI

→

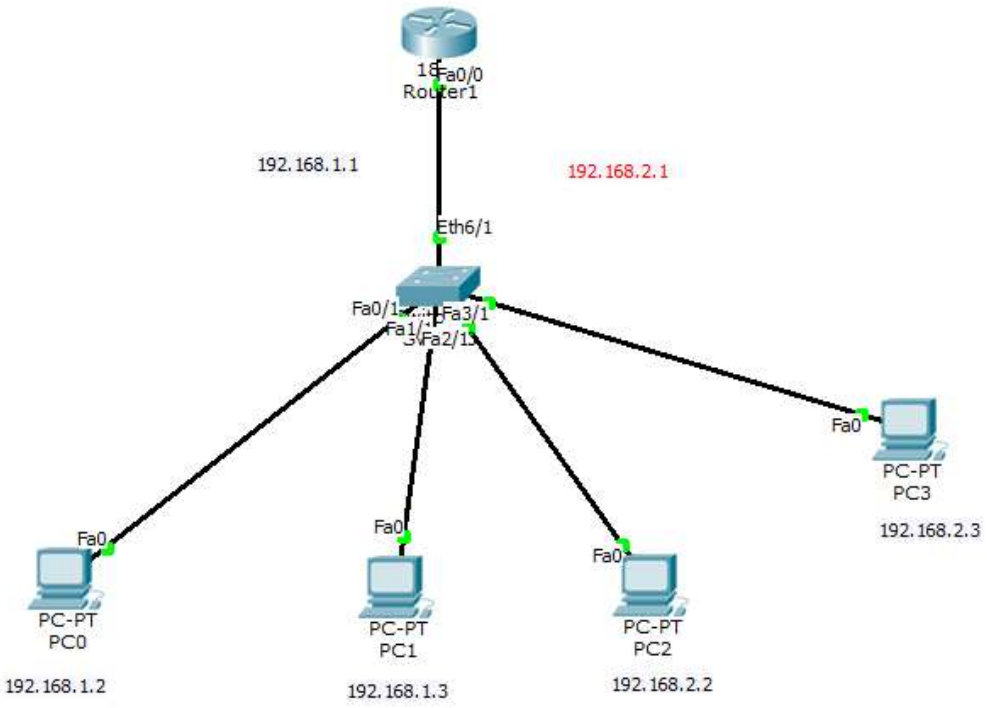
9) Vlan database → Vlan 2 name cseise → exit.
10) Config terminal → interface : Fa 0/0.1 → encapsulation dot1q 2 → ip address 192.168.2.1 255.255.255.0 → No shut → exit → exit.
11) Enter Show IP Route
12) Ping from one device to the other

Result
show ip route
C 192.168.1.0/24 is directly connected, Fa 0/0
C 192.168.2.0/24 . . . . . , Fa 0/0.1
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

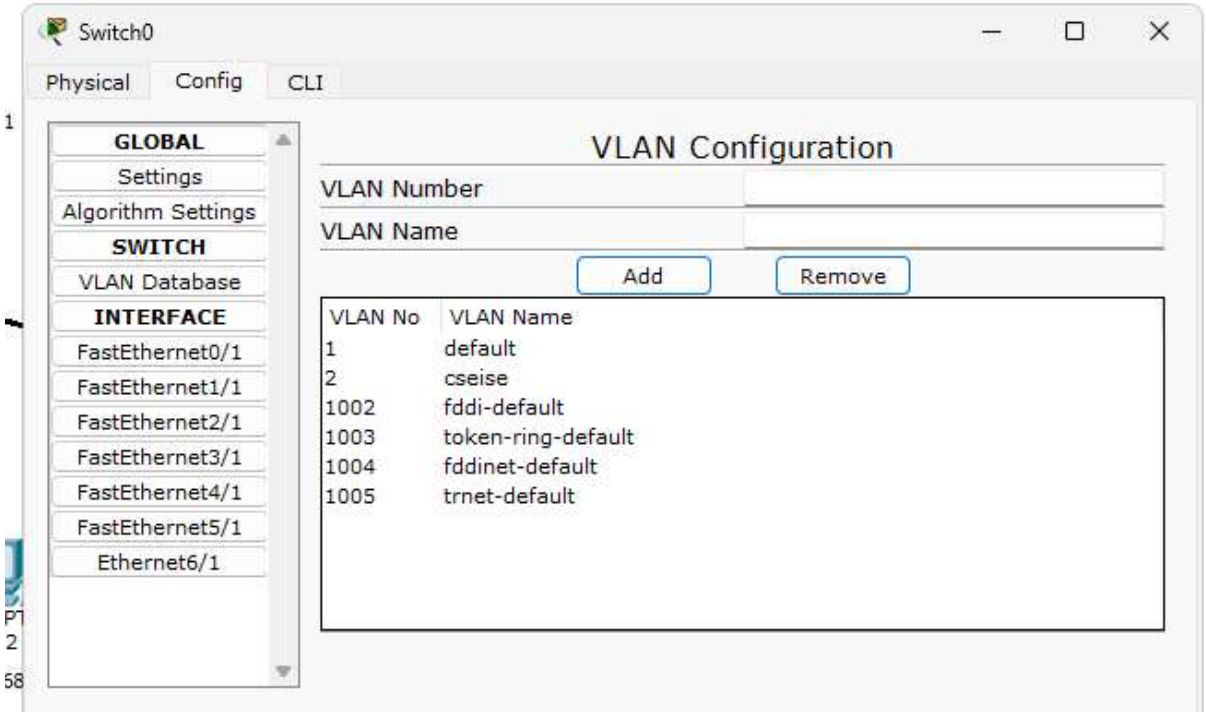
same for other devices

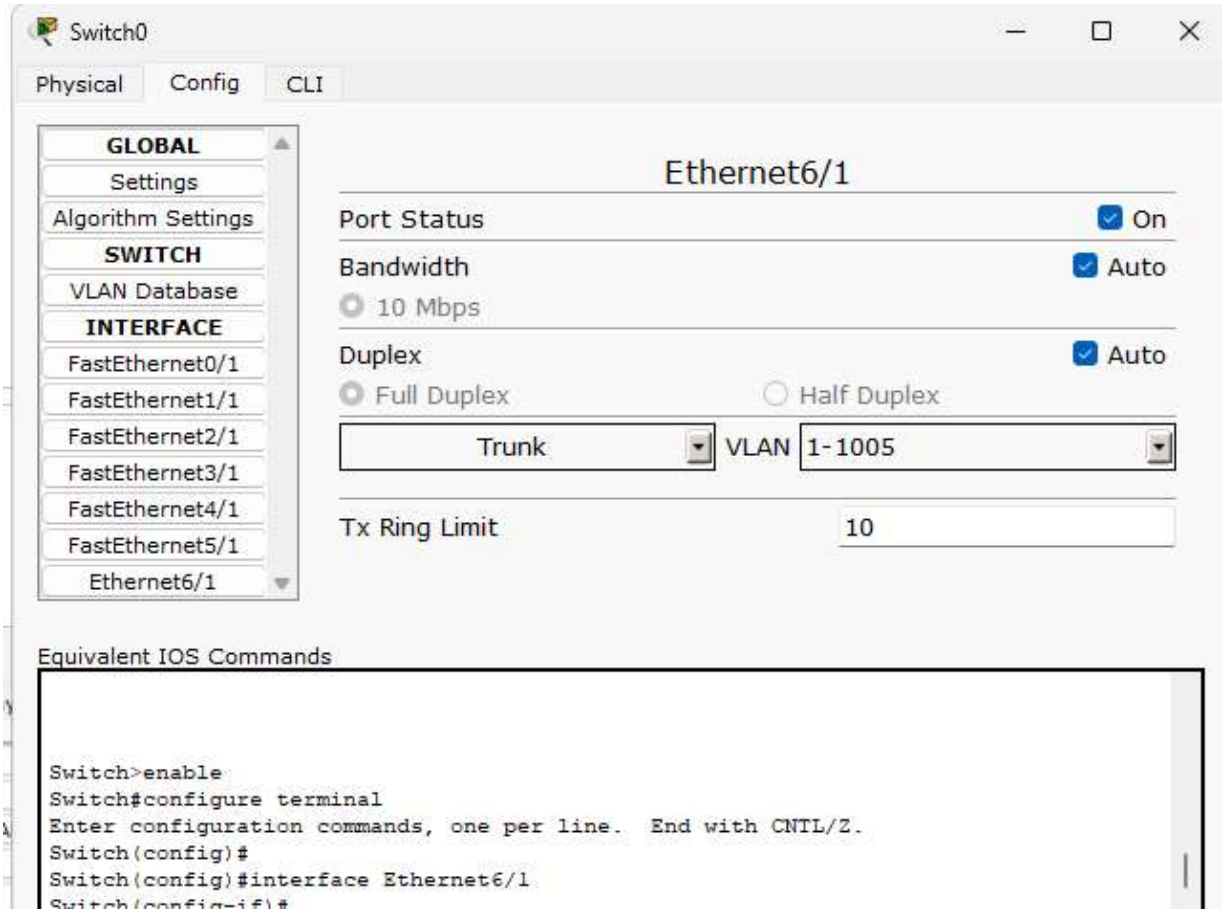
Observation:
router) The VLAN experiment involves creating and configuring VLANs to segment a network, assigning IP's to devices for seamless intra-VLAN communications & using dot1q encapsulation for inter-VLAN connectivity to communicate through a single trunk link. This experiment highlights the importance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

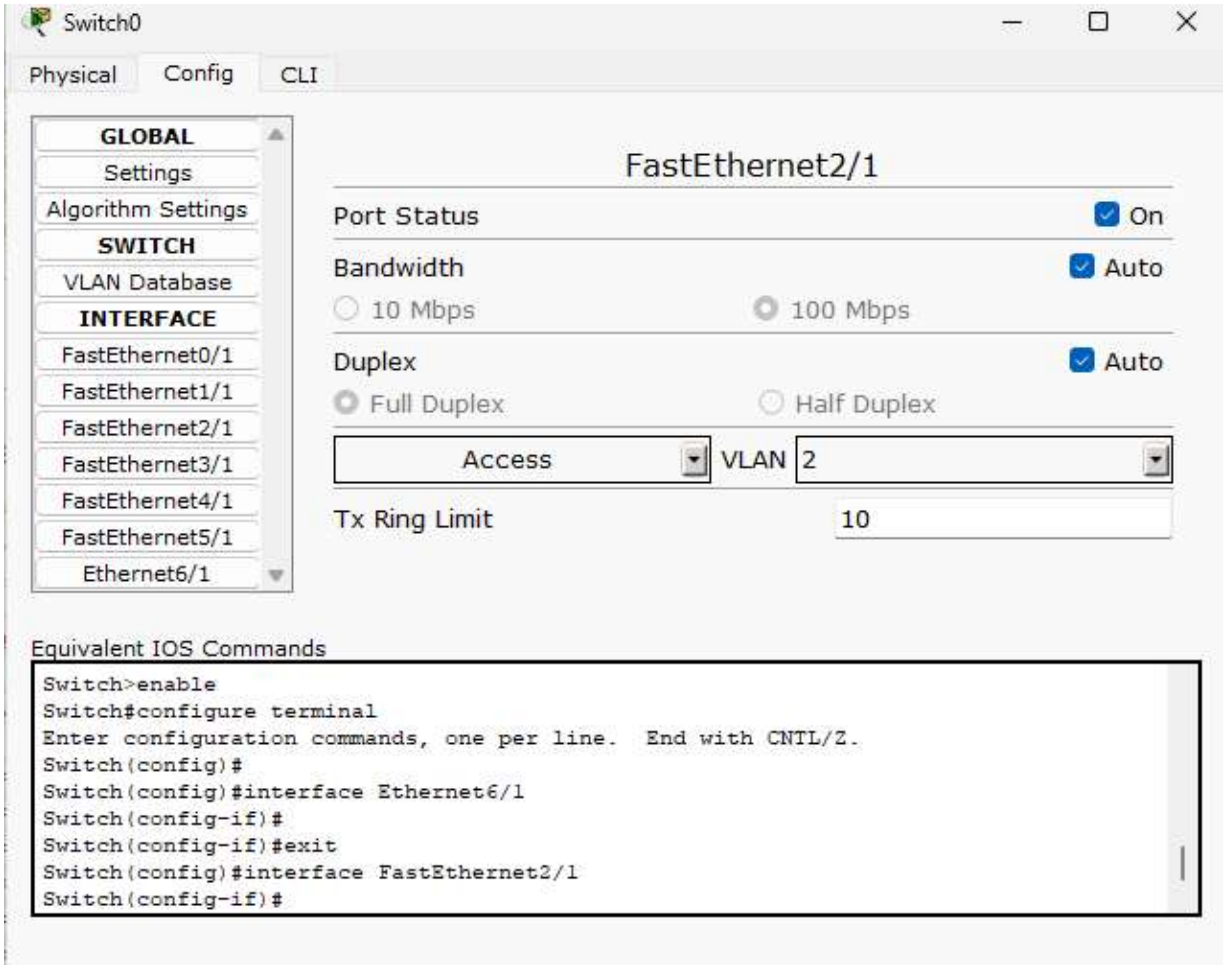
28/12/24

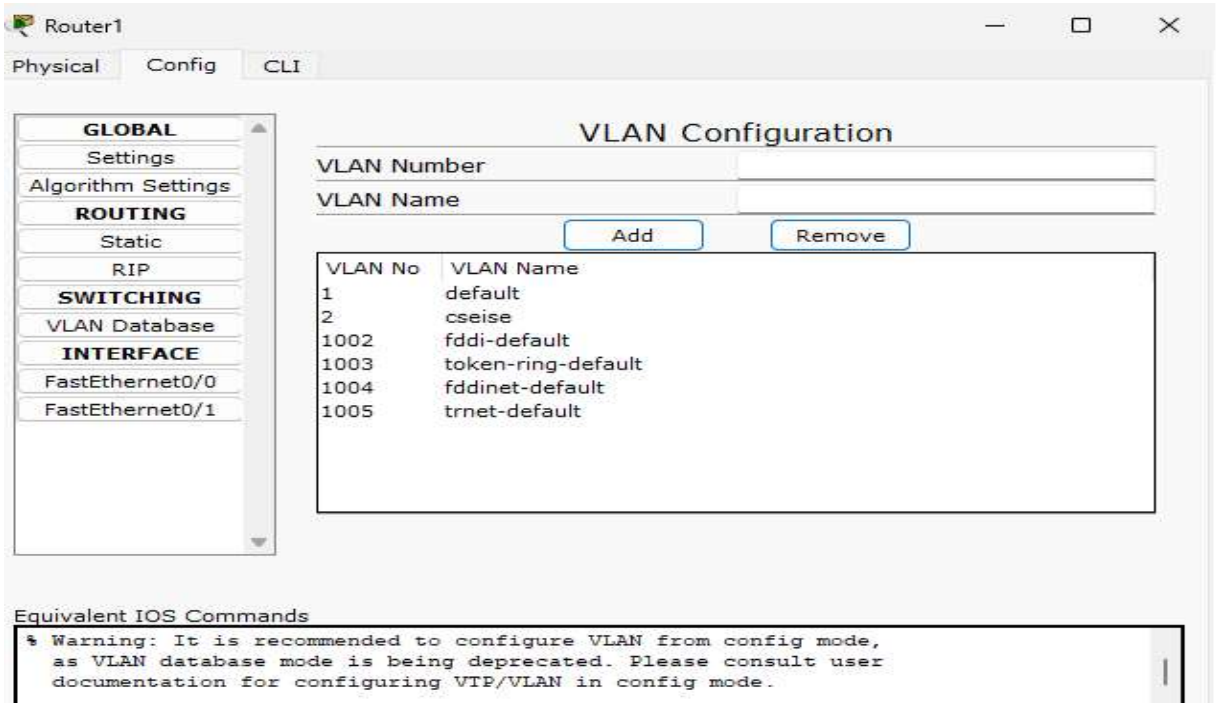



```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut

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

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

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


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
VLAN Configuration
VLAN Number
VLAN Name
Add
Remove
VLAN No
VLAN Name
1 default
2 cseise
1002 fddi-default
1003 token-ring-default
1004 fddinet-default
1005 trnet-default

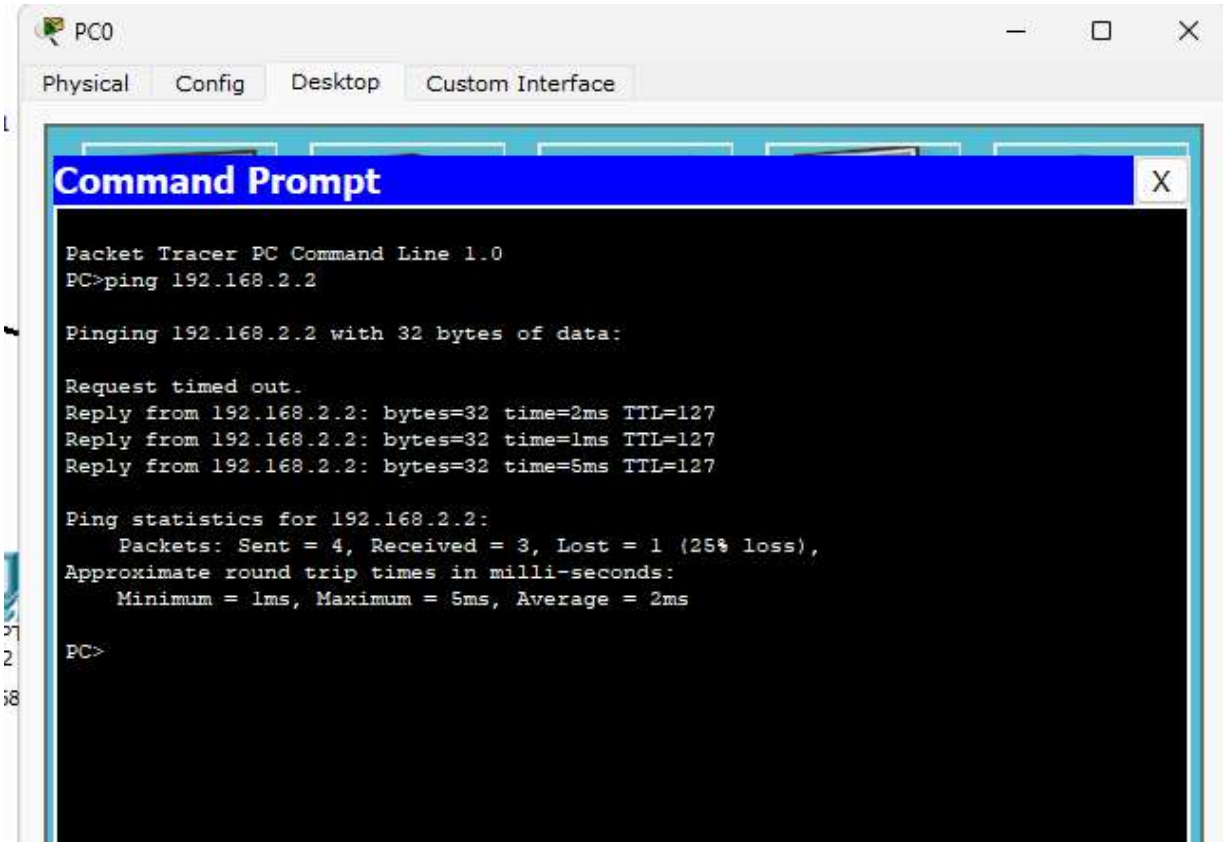

Switch0
Physical
Config
CLI
GLOBAL
Settings
Algorithm Settings
SWITCH
VLAN Database
INTERFACE
FastEthernet0/1
FastEthernet1/1
FastEthernet2/1
FastEthernet3/1
FastEthernet4/1
FastEthernet5/1
Ethernet6/1
Ethernet6/1
Port Status
On
Bandwidth
Auto
10 Mbps
Duplex
Auto
Full Duplex
Half Duplex
Trunk
VLAN
1-1005
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

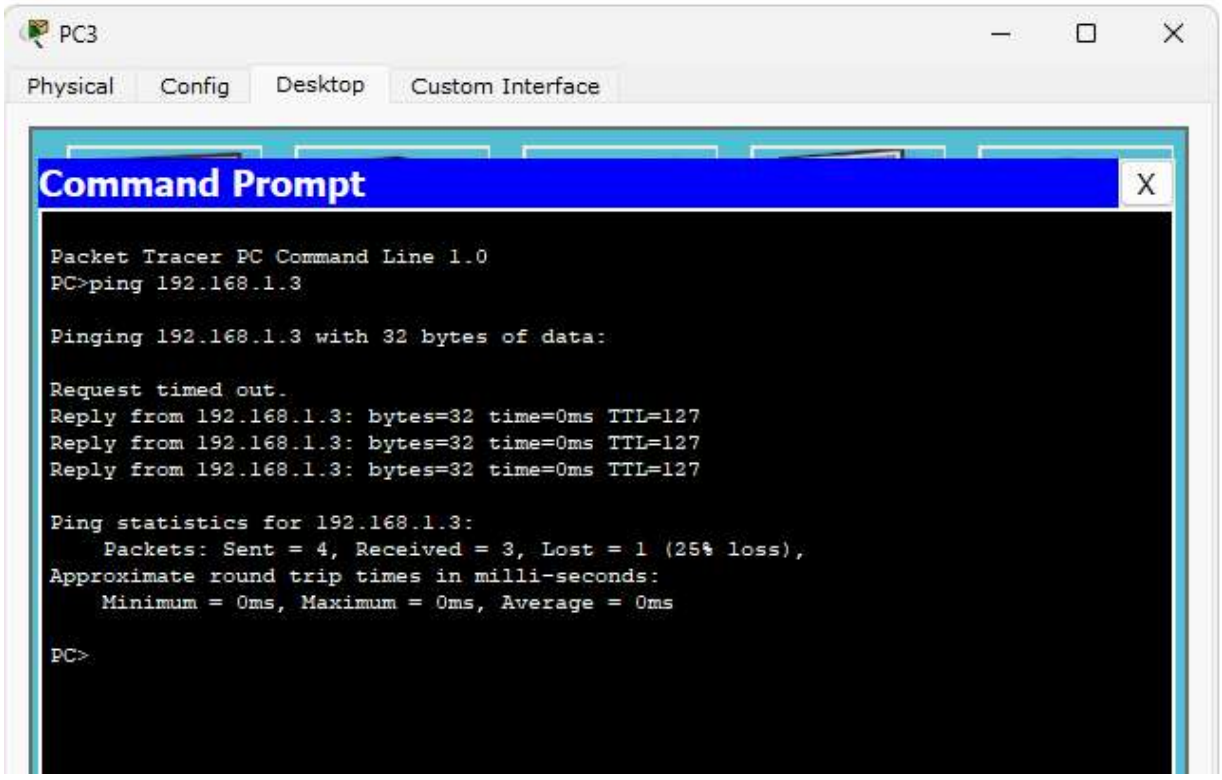

Switch0
Physical
Config
CLI
GLOBAL
Settings
Algorithm Settings
SWITCH
VLAN Database
INTERFACE
FastEthernet0/1
FastEthernet1/1
FastEthernet2/1
FastEthernet3/1
FastEthernet4/1
FastEthernet5/1
Ethernet6/1
FastEthernet2/1
Port Status
On
Bandwidth
Auto
10 Mbps
100 Mbps
Duplex
Auto
Full Duplex
Half Duplex
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 fddi-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)#
```

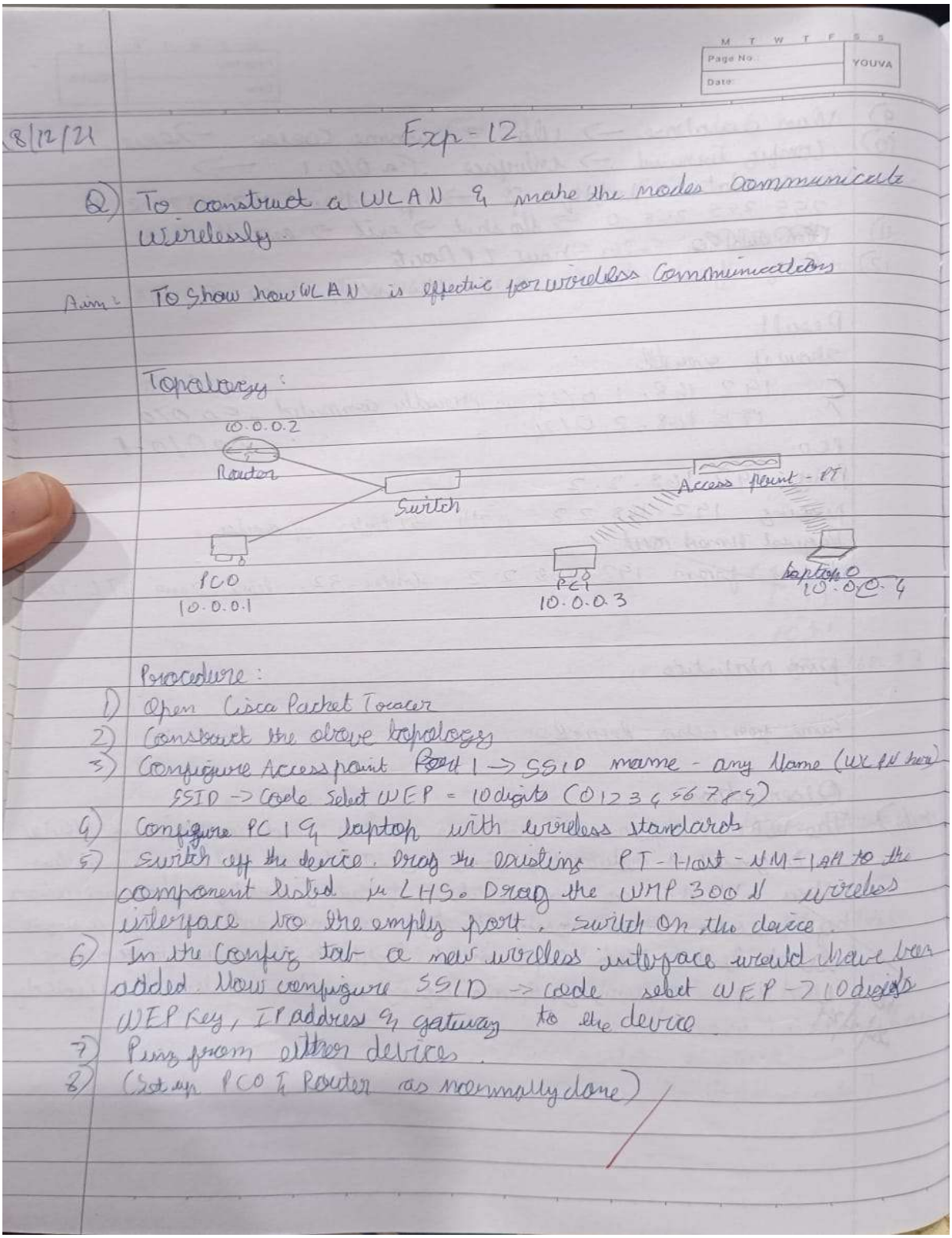
```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - 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



8/12/24

Exp - 12

Q) To construct a WLAN & make the nodes communicate wirelessly.

Aim: To show how WLAN is effective for wireless communications

Topology:

Procedure:

1) Open Cisco Packet Tracer
2) Construct the above topology
3) Configure Access point Port 1 → SSID name - any name (UK all here)
   SSID → Code select WEP = 10 digits (0123456789)
4) Configure PC1 & laptop with wireless standards
5) Switch off the device. Drag the existing PT-Host-NM-1AM to the component listed in LHS. Drag the WMP 300N wireless interface into the empty port. Switch on the device.
6) In the Config tab a new wireless interface would have been added. Now configure SSID → code select WEP - 10 digits WEP key, IP address & gateway to the device.
7) Ping from either devices.
8) (Set up PC0 & Router as normally done)

Result

PC0

ping 10.0.0.3

pinging 10.0.0.3 with 32 bytes of data:

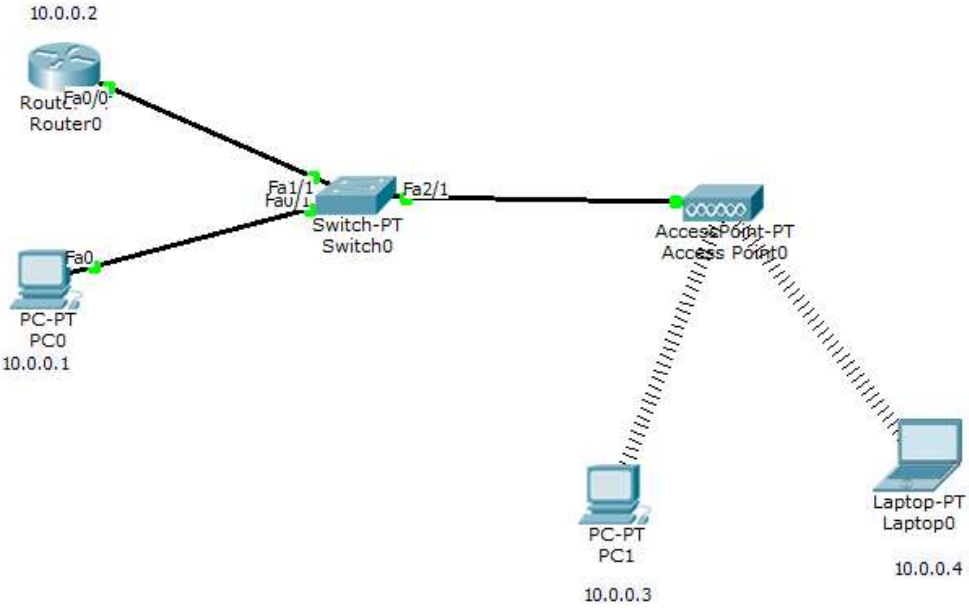
Reply from 10.0.0.3 : bytes = 32, time = 14ms TTL = 128

Ping Statistics

Same for other devices.

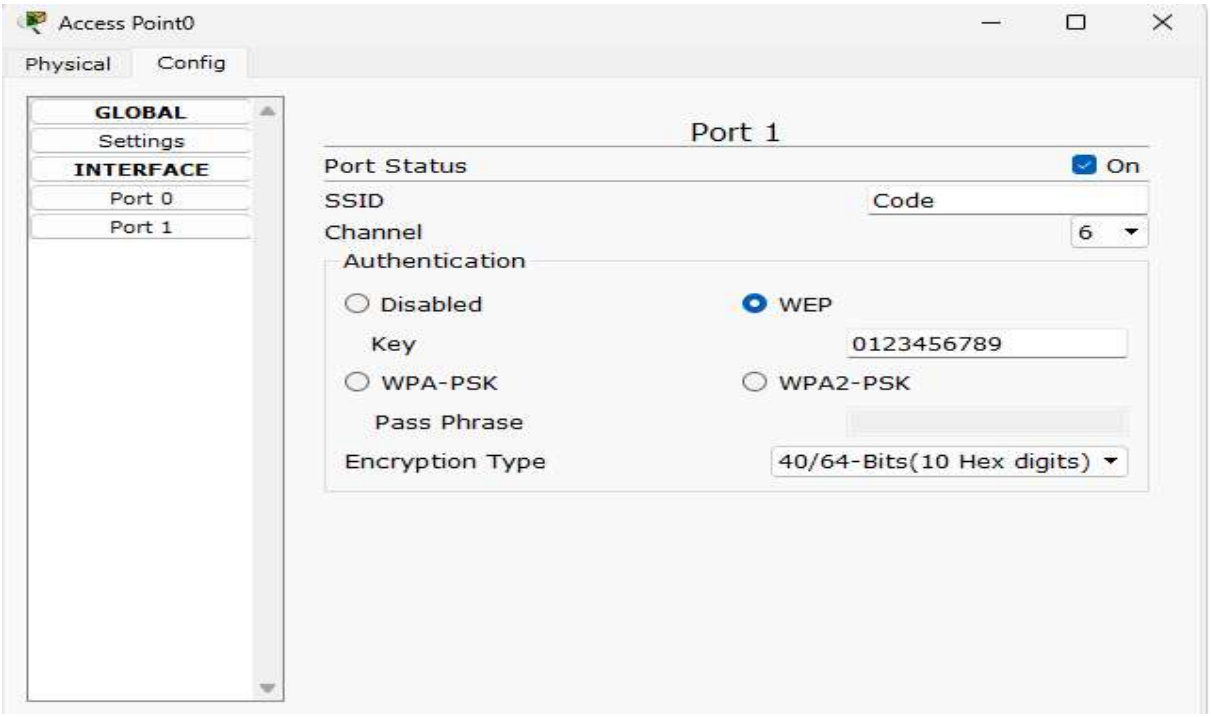
Observation:

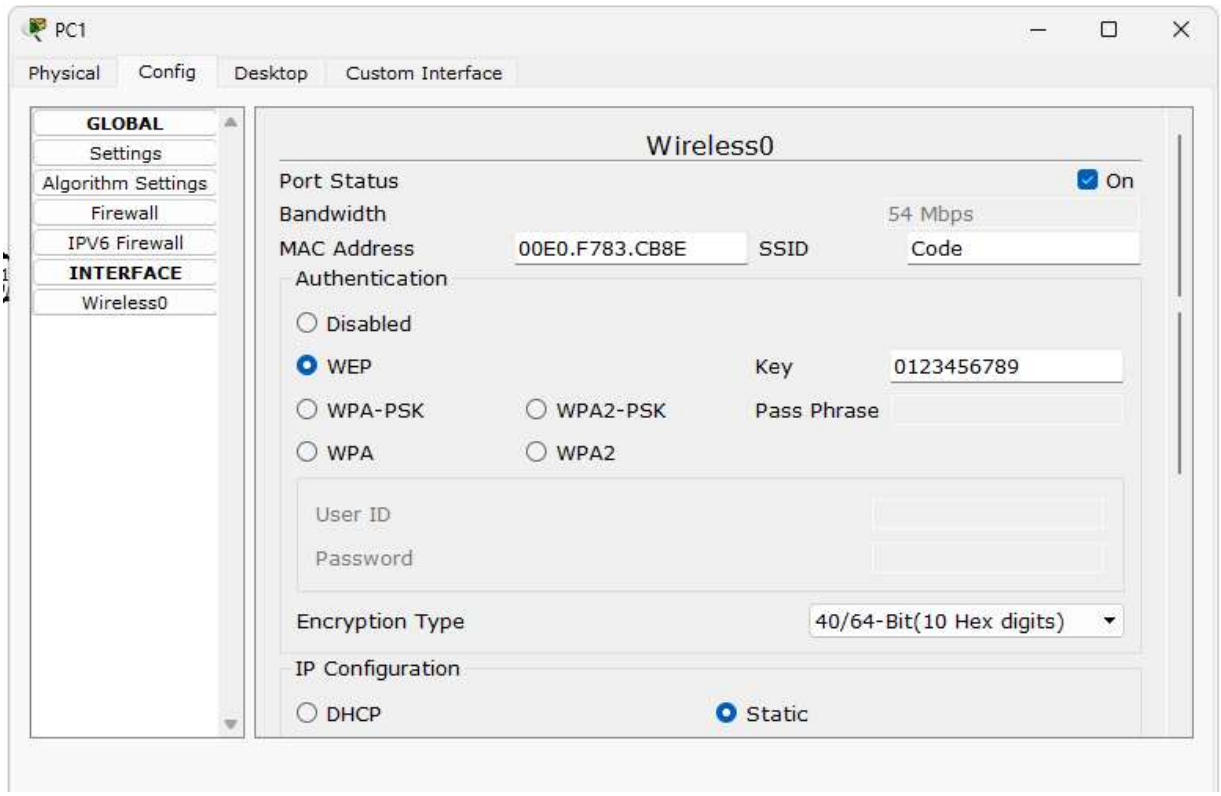
The Experiment demonstrates the creation of a wireless network using an access point configured with an SSID, WEP encryption & a 10 digit key. Devices like PC's & laptops were configured with wireless adapters, IP addresses & gateways to enable communication. The success of ping tests b/w devices verify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

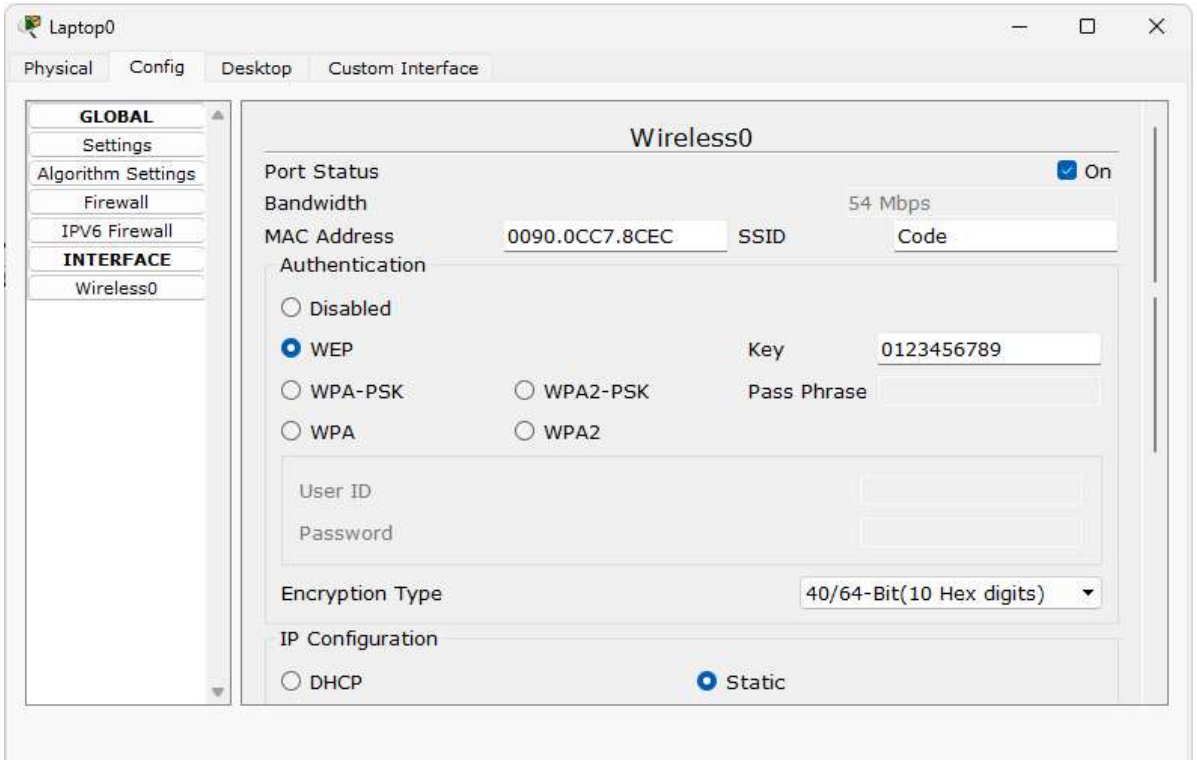


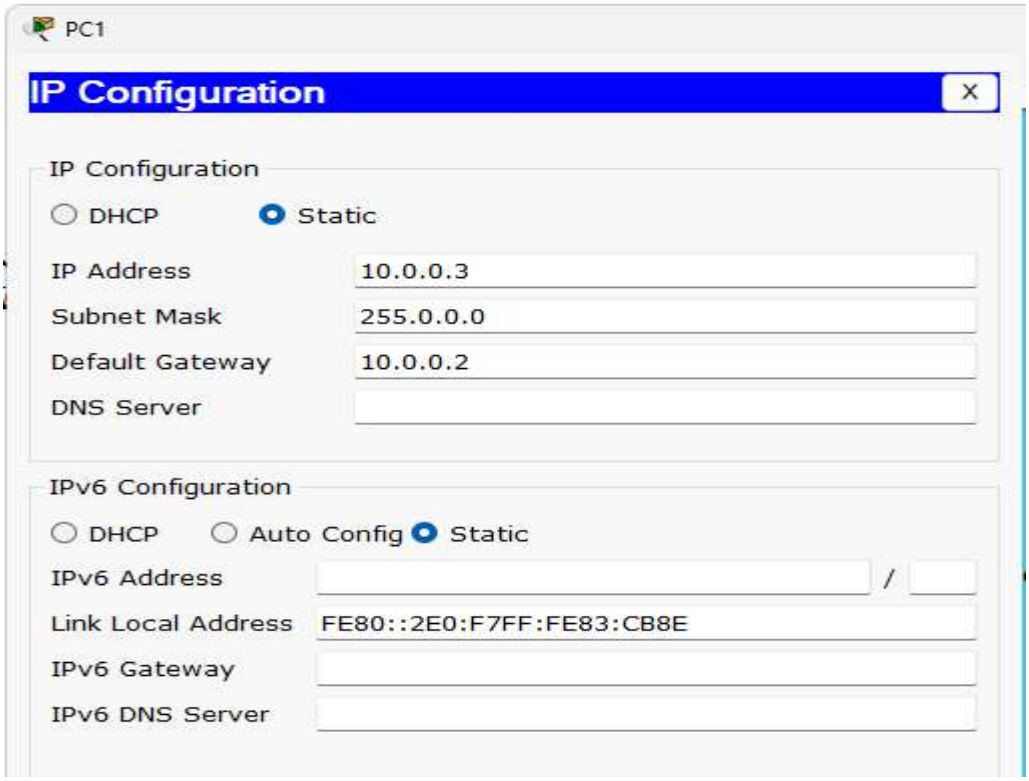

```
         --- System Configuration Dialog ---

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 t
o up

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

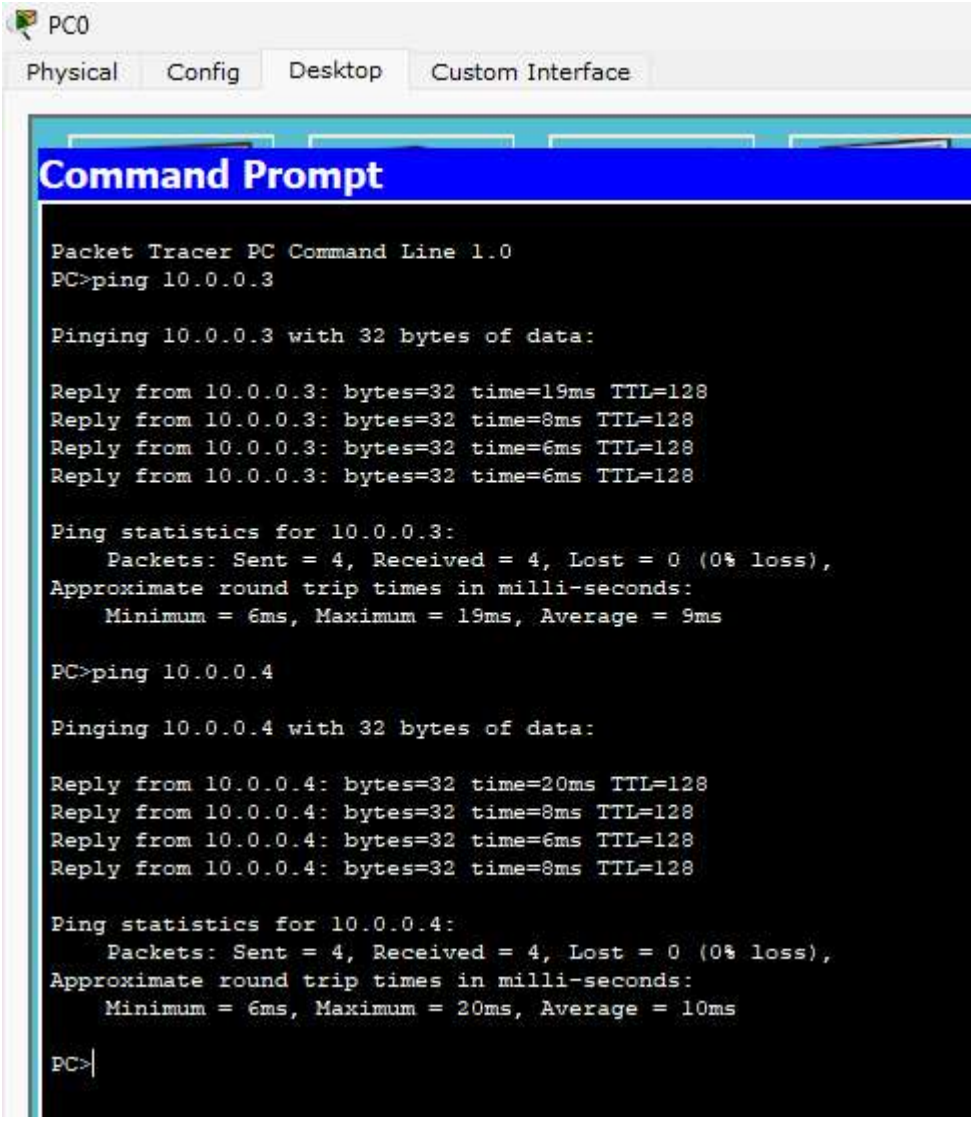

Physical
Config
Desktop
Custom Interface
MODULES
Linksys-WPC300N
PT-LAPTOP-NM-1AM
PT-LAPTOP-NM-1CE
PT-LAPTOP-NM-1CFE
PT-LAPTOP-NM-1CGE
PT-LAPTOP-NM-1FFE
PT-LAPTOP-NM-1FGE
PT-LAPTOP-NM-1W
PT-LAPTOP-NM-1W-A
PT-HEADPHONE
PT-MICROPHONE
PT-CAMERA
PT-USB-HARD-DRIVE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
Adding Modules: Drag the module to an available slot on the device.
Removing Modules: Drag the module from the device to the module list.


Access Point0
Physical
Config
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
Code
Channel
6
Authentication
Disabled
WEP
Key
0123456789
WPA-PSK
WPA2-PSK
Pass Phrase
Encryption Type
40/64-Bits(10 Hex digits)


PC1
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
Firewall
IPV6 Firewall
INTERFACE
Wireless0
Wireless0
Port Status
On
Bandwidth
54 Mbps
MAC Address
00E0.F783.CB8E
SSID
Code
Authentication
Disabled
WEP
Key
0123456789
WPA-PSK
WPA2-PSK
Pass Phrase
WPA
WPA2
User ID
Password
Encryption Type
40/64-Bit(10 Hex digits)
IP Configuration
DHCP
Static


Laptop0
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
Firewall
IPV6 Firewall
INTERFACE
Wireless0
Wireless0
Port Status
On
Bandwidth
54 Mbps
MAC Address
0090.0CC7.8CEC
SSID
Code
Authentication
Disabled
WEP
Key
0123456789
WPA-PSK
WPA2-PSK
Pass Phrase
WPA
WPA2
User ID
Password
Encryption Type
40/64-Bit(10 Hex digits)
IP Configuration
DHCP
Static

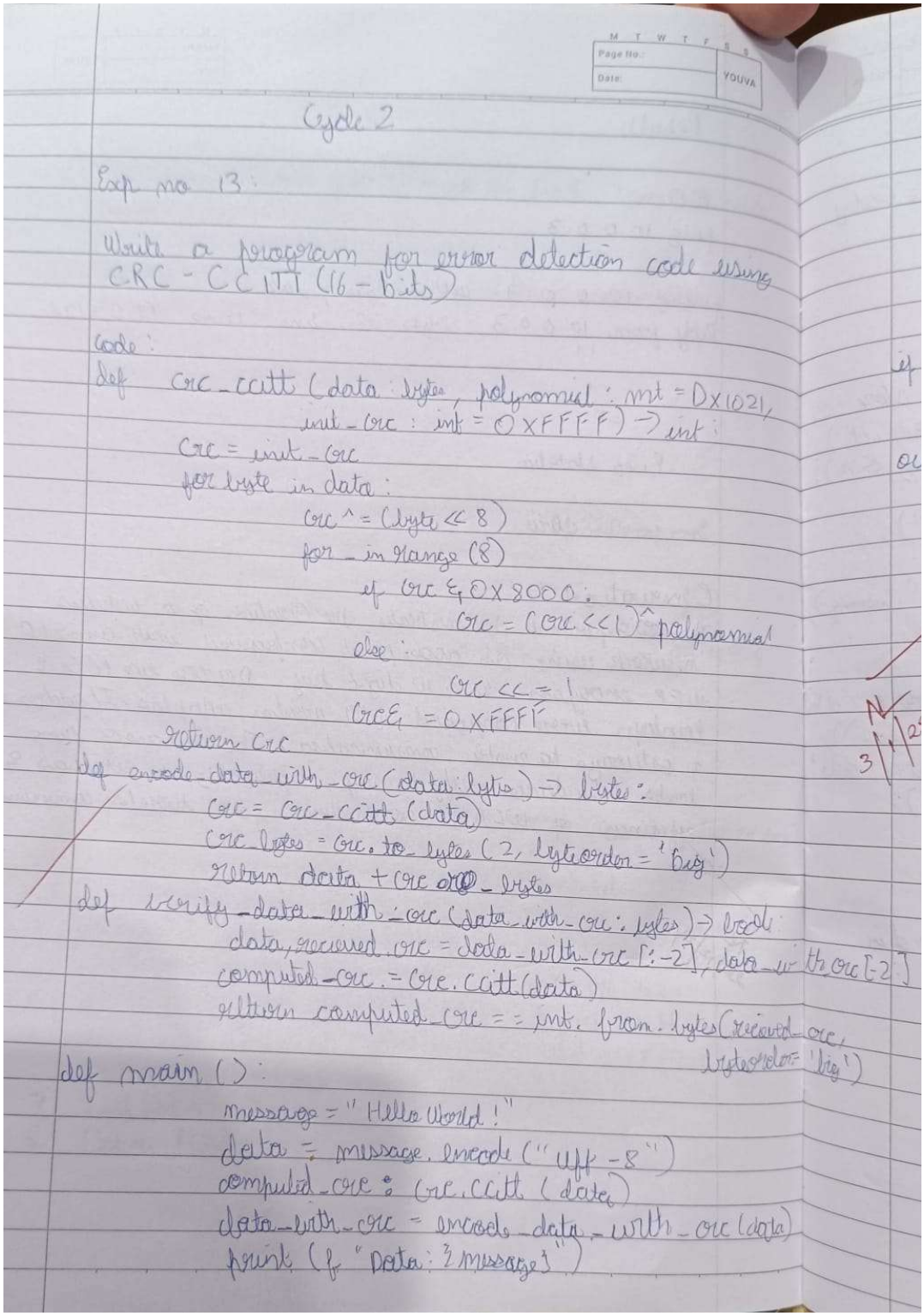

PC1
IP Configuration
IP Configuration
DHCP
Static
IP Address
10.0.0.3
Subnet Mask
255.0.0.0
Default Gateway
10.0.0.2
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address
FE80::2E0:F7FF:FE83:CB8E
IPv6 Gateway
IPv6 DNS Server


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).



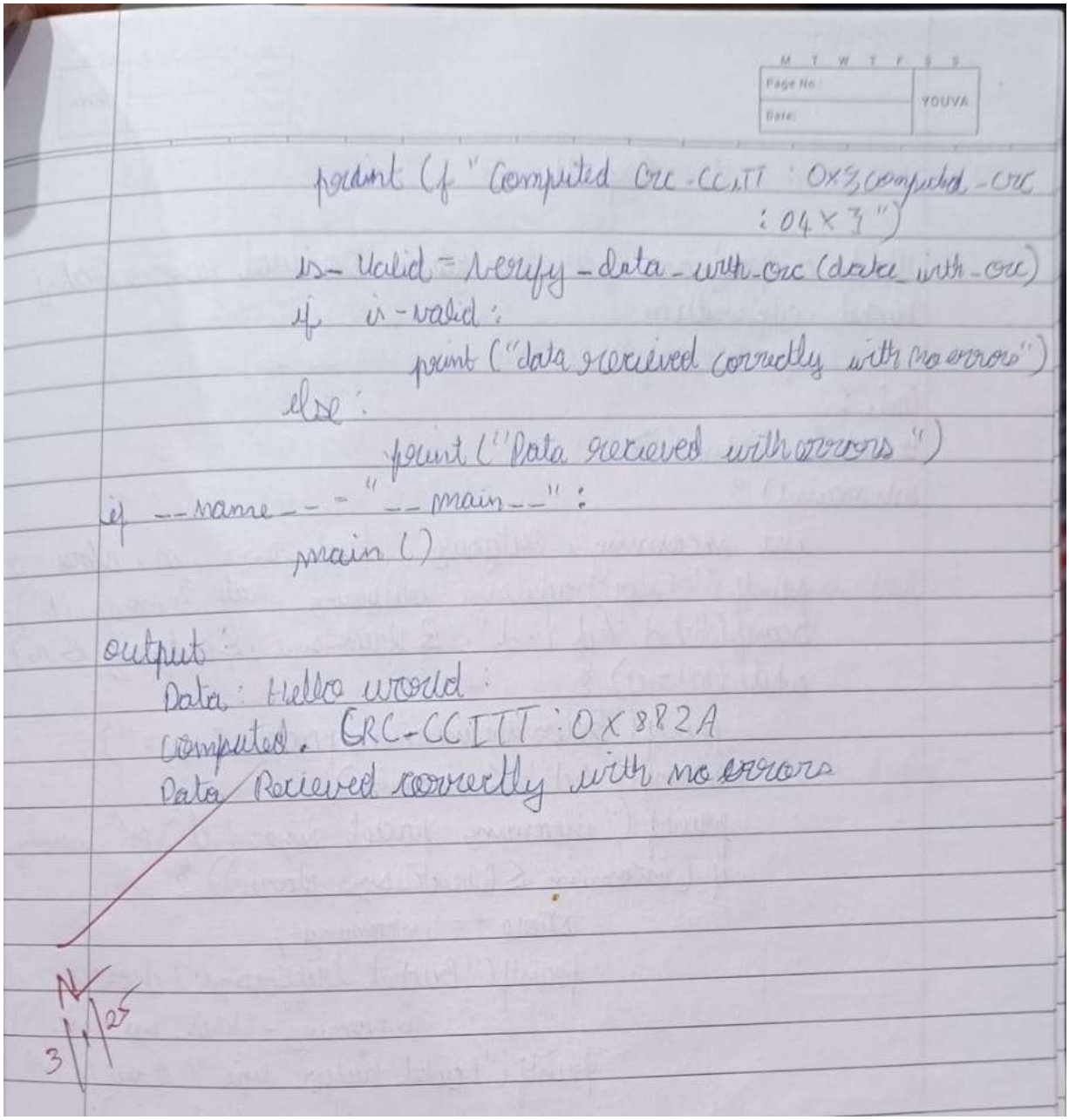
Cycle 2

Exp no 13:

Write a program for error detection code using CRC - CCITT (16 - bits)

code:

```
def crc_ccitt(data: bytes, polynomial: int = 0x1021,
              init_crc: int = 0xFFFF) -> int:
    crc = init_crc
    for byte in data:
        crc ^= (byte << 8)
        for _ in range(8):
            if crc & 0x8000:
                crc = (crc << 1) ^ polynomial
            else:
                crc <<= 1
            crc &= 0xFFFF
    return crc
def encode_data_with_crc(data: bytes) -> bytes:
    crc = crc_ccitt(data)
    crc_bytes = crc.to_bytes(2, byteorder='big')
    return data + crc_bytes
def verify_data_with_crc(data_with_crc: bytes) -> bool:
    data, received_crc = data_with_crc[:-2], data_with_crc[-2:]
    computed_crc = crc.crc_ccitt(data)
    return computed_crc == int.from_bytes(received_crc,
                                          byteorder='big')
def main():
    message = "Hello World!"
    data = message.encode("utf-8")
    computed_crc = crc.crc_ccitt(data)
    data_with_crc = encode_data_with_crc(data)
    print(f"Data: {message}")
```



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)
```

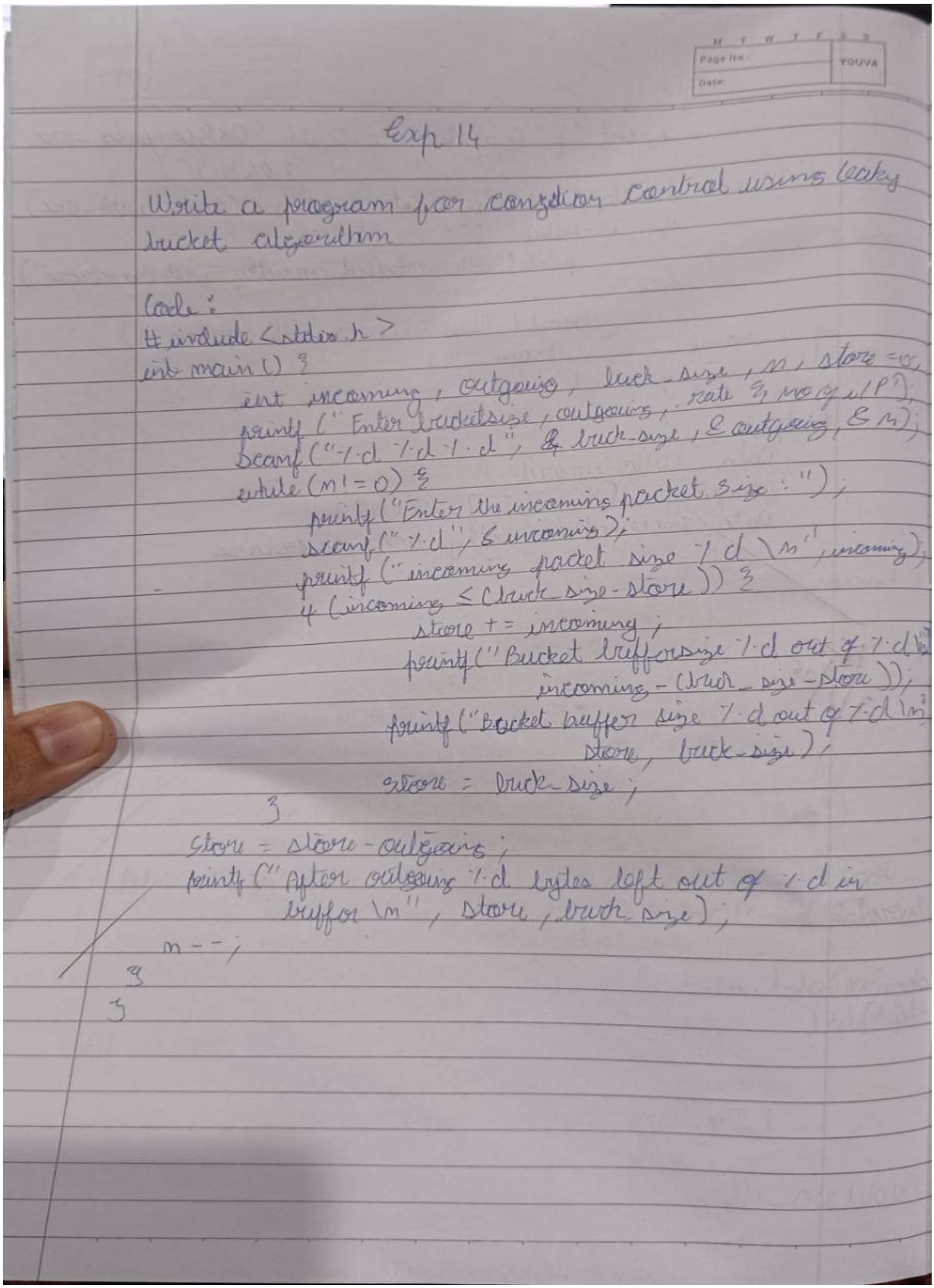
```
# Decoding
print("\nDecoding the encoded data...")
decode(encoded_data, key)
```

Output

```
Enter the data bits: 1001001000100100
Enter the key (divisor): 1101
Encoded Data: 10010010001001000111

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.

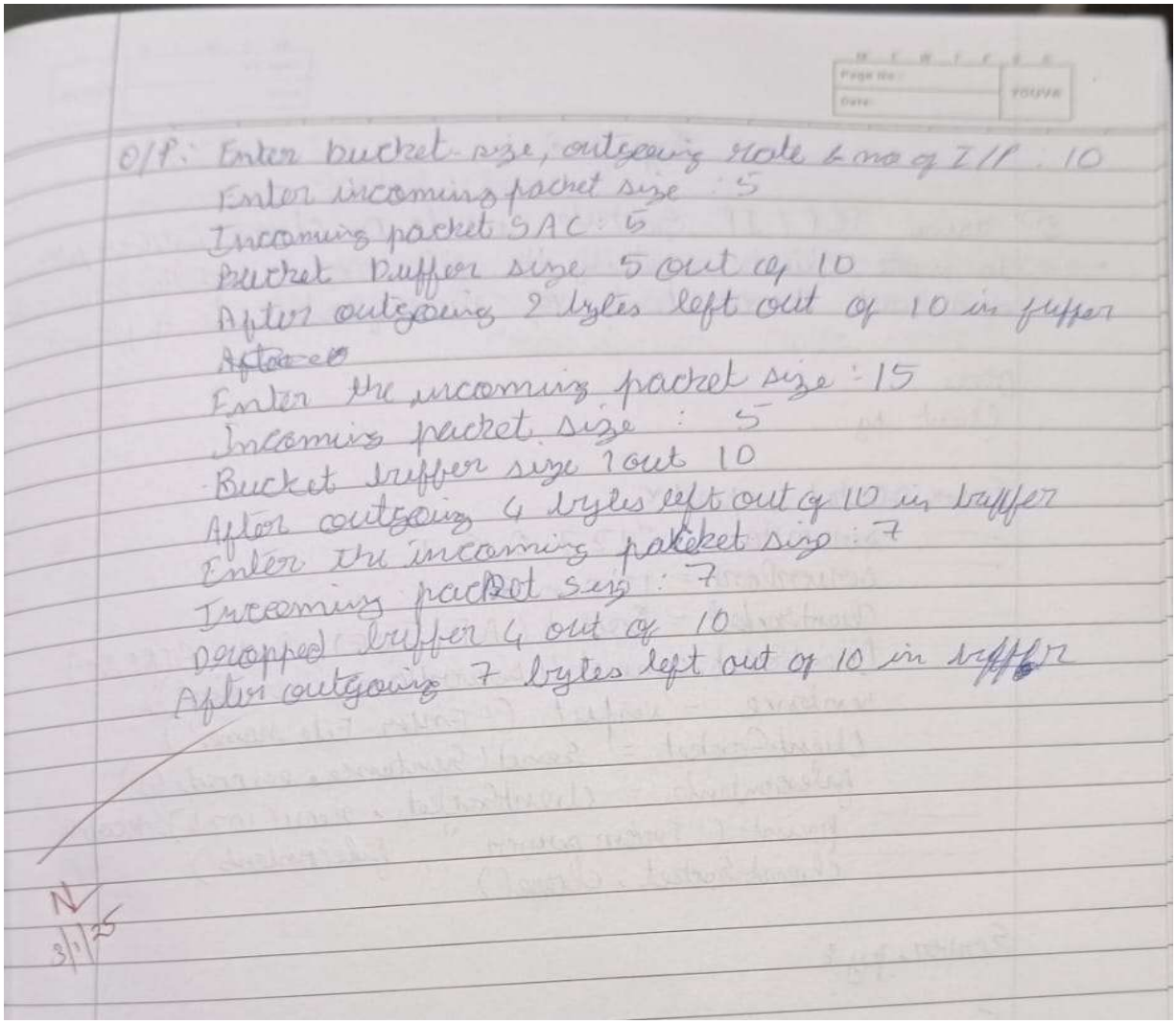


Exp 14

Write a program for congestion control using leaky bucket algorithm

Code:

```
#include<stdio.h>
int main() {
    int incoming, outgoing, buck_size, n, store=0;
    printf("Enter bucketsize, outgoing, rate & no of i/p");
    scanf("%d %d %d", &buck_size, &outgoing, &n);
    while(n!=0) {
        printf("Enter the incoming packet size:");
        scanf("%d", &incoming);
        printf("incoming packet size %d \n", incoming);
        if(incoming <= (buck_size-store)) {
            store += incoming;
            printf("Bucket buffersize %d out of %d\n",
                incoming-(buck_size-store));
            printf("Bucket buffer size %d out of %d \n",
                store, buck_size);
            store = buck_size;
        }
        store = store-outgoing;
        printf("After outgoing %d bytes left out of %d in
            buffer \n", store, buck_size);
        n--;
    }
}
```



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)]
```

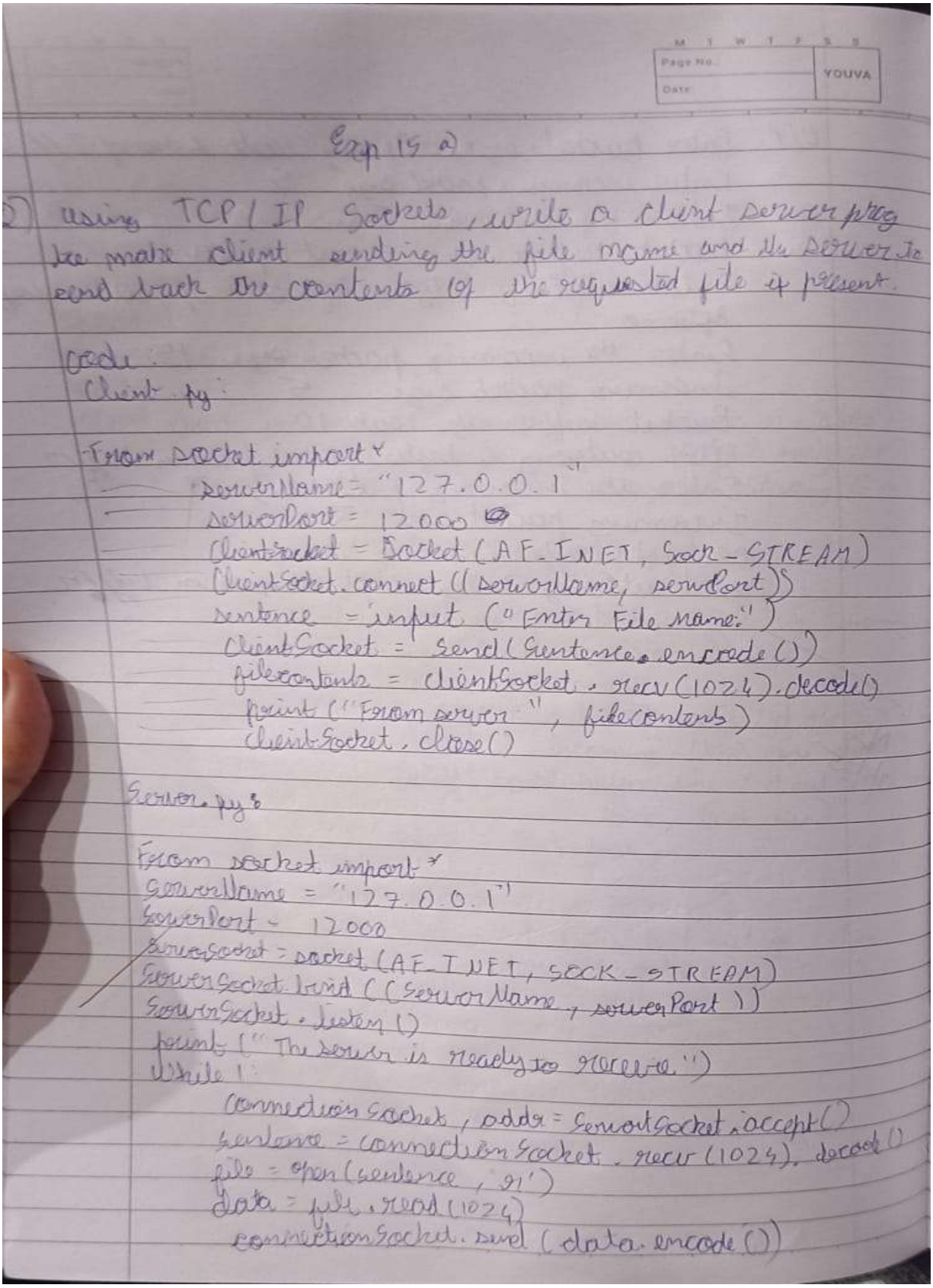
```
    for i in range(NOF_PACKETS):
        print(f"packet[{i}]: {packet_size[i]} bytes")

    # 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

```
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

2) 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.

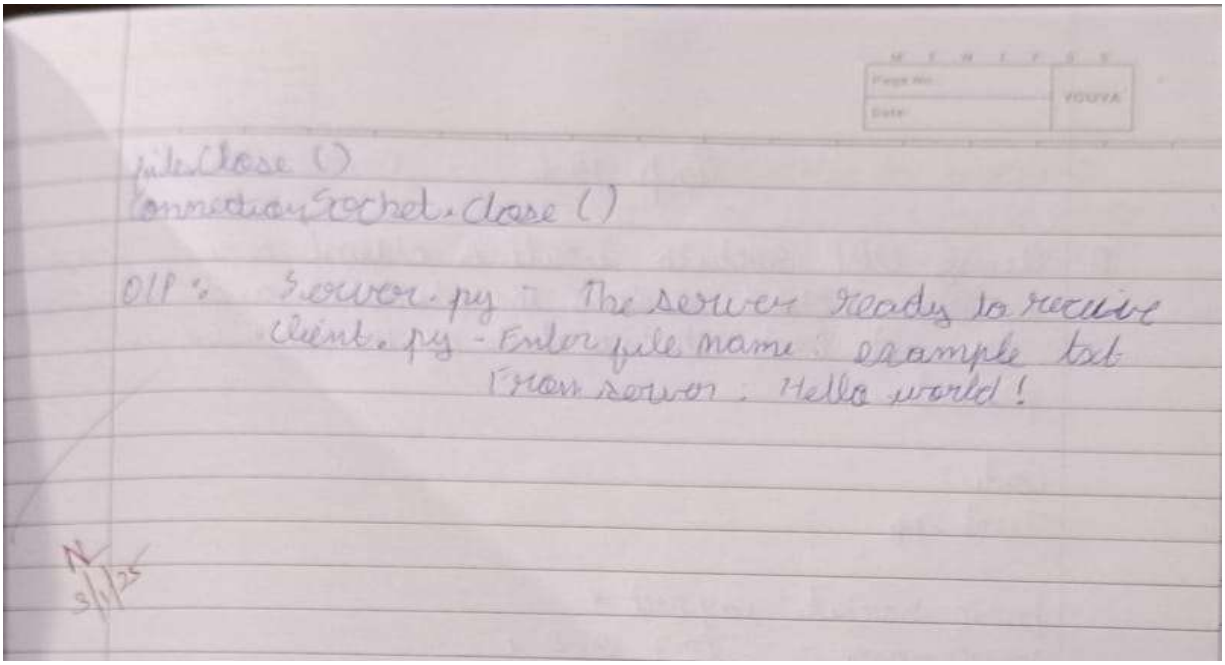
code:

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 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()
    file = open(sentence, 'r')
    data = file.read(1024)
    connectionSocket.send(data.encode())
```



Code: Client.py

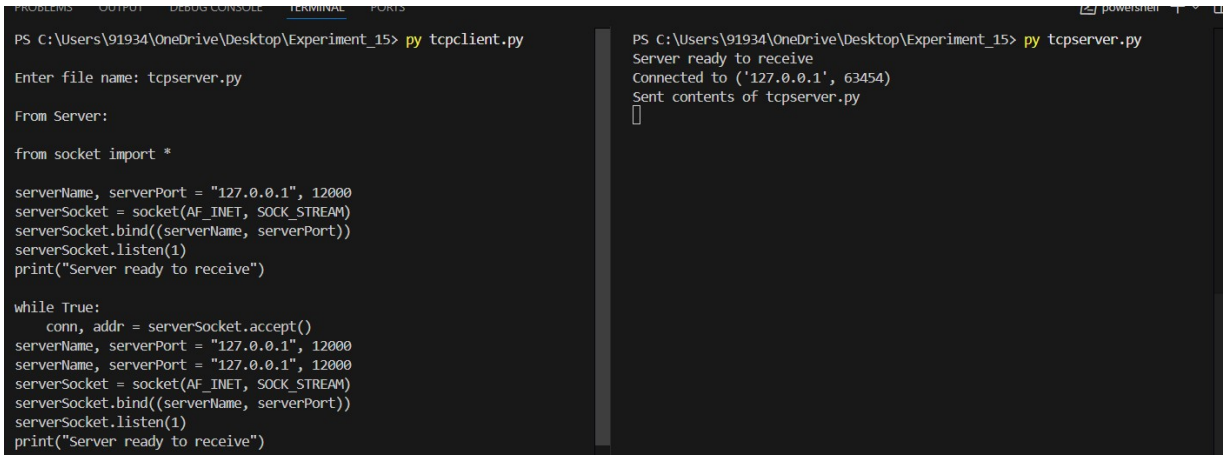
```
from socket import * serverName = "127.0.0.1"  # Server
address (localhost) serverPort = 12000  # Port number
where the server listens

  # 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 *
```

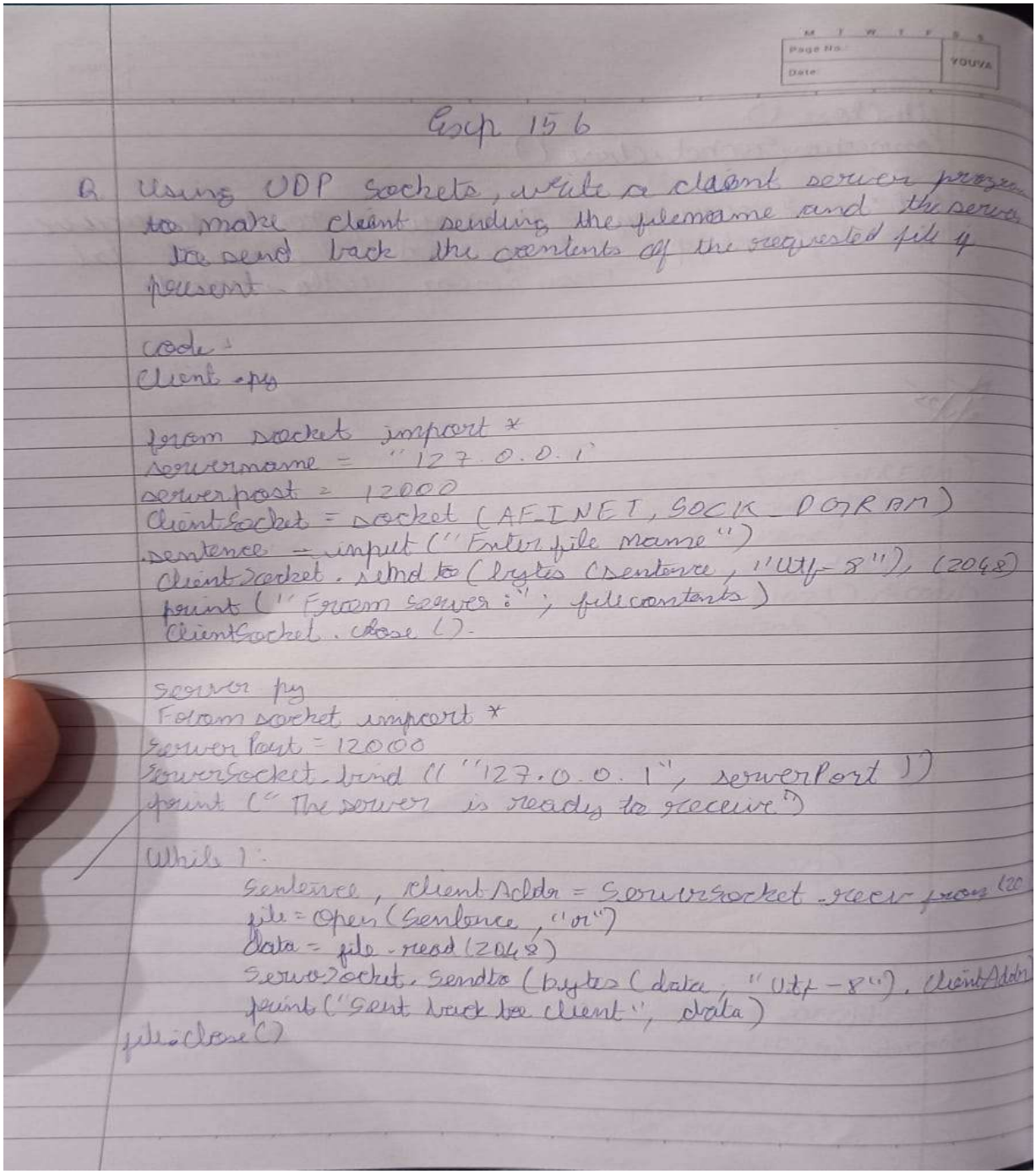
```
  serverName = "127.0.0.1"  # Server address (localhost)
serverPort = 12000  # Port number to listen on

  # 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



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.



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Exp 15 b

Q Using UDP sockets, write a client server program to make client sending the filename and the server to send back the contents of the requested file if present.

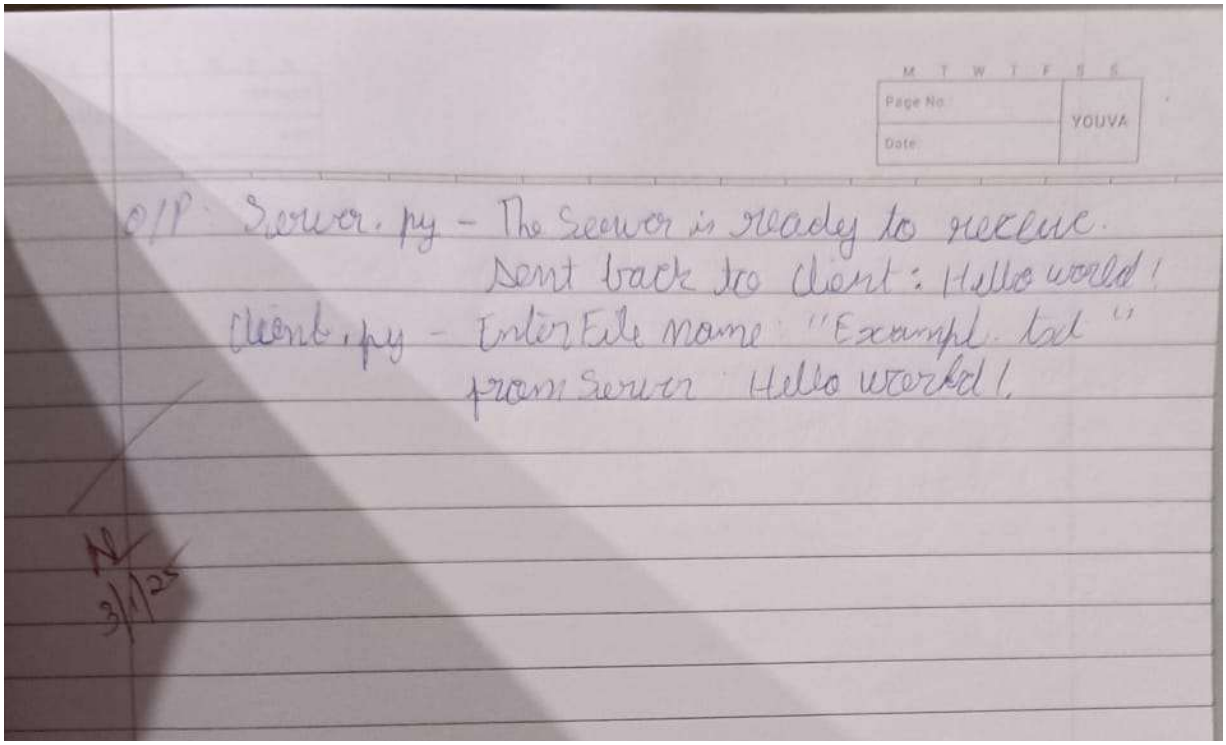
code:
Client.py

```
from socket import *
servername = "127.0.0.1"
serverport = 12000
ClientSocket = socket(AF_INET, SOCK_DGRAM)
sentence = input("Enter file name")
ClientSocket.sendto(bytes(sentence, "utf-8"), (2048)
print("From server:", filecontents)
ClientSocket.close().
```

server.py

```
From socket import *
serverPort = 12000
ServerSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")

While 1:
    Sentence, clientAddr = ServerSocket.recvfrom(20
    file = open(Sentence, "r")
    data = file.read(2048)
    ServerSocket.sendto(bytes(data, "utf-8"), clientAddr)
    print("Sent back to client", data)
file.close()
```



Code: ClientUDP.py

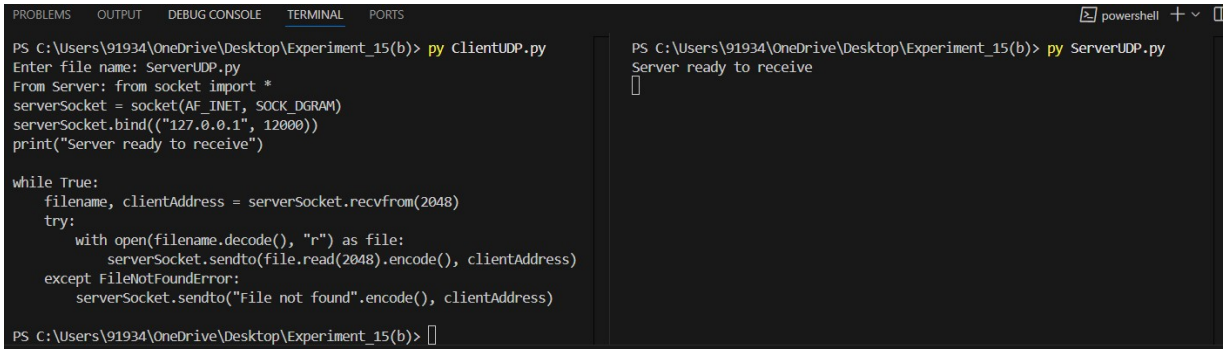
```
from socket import *
serverName, serverPort = "127.0.0.1", 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
filename = input("Enter file name: ")
clientSocket.sendto(filename.encode(), (serverName,
serverPort))
data, _ = clientSocket.recvfrom(2048)
print("From Server:", data.decode())
clientSocket.close()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

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


PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
powershell
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)>
PS C:\Users\91934\OneDrive\Desktop\Experiment_15(b)> py ServerUDP.py
Server ready to receive