VISVESVARAYATECHNOLOGICALUNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB RECORD

Computer Network Lab (23CS5PCCON)

Submitted by

HARSHAVARDHAN BR(1BM22CS110)

in partial fulfillment for the award of the degree of

BACHELOROFENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

BENGALURU-560019 Academic Year 2024-25 (odd)

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 Network (23CS5PCCON)" carried out by **Harshavardhan BR (1BM22CS110),** who is a bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements of the above-mentioned subject and the work prescribed for the said degree.

Spoorthi DM Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

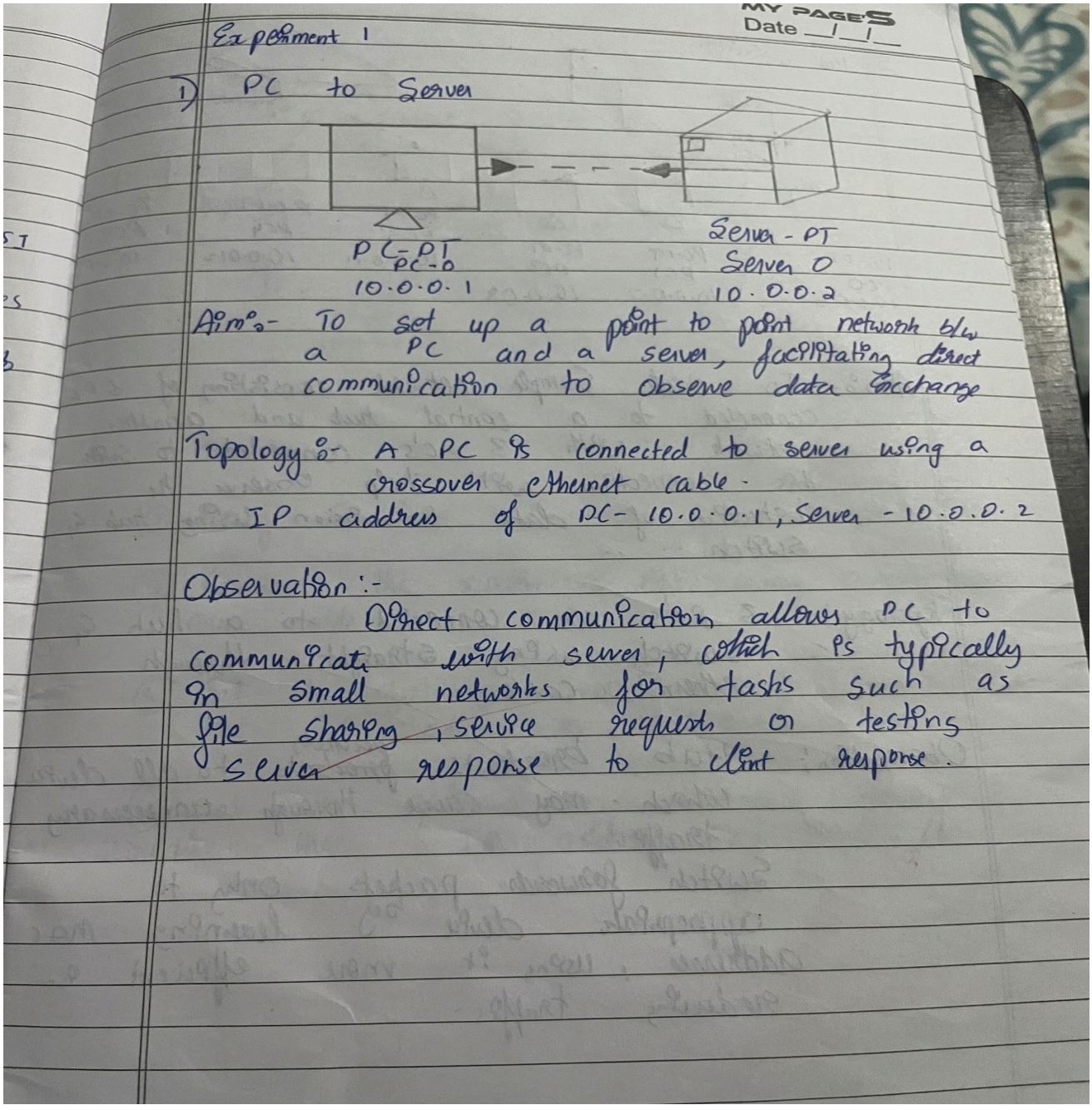
Index

Github Link: https://github.com/cr7Harsha7/CN-LAB

Program 1

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

Topology , Procedure and Observation:



Experiment 1

1) PC to Server

PC-PT PC-0 10.0.0.1

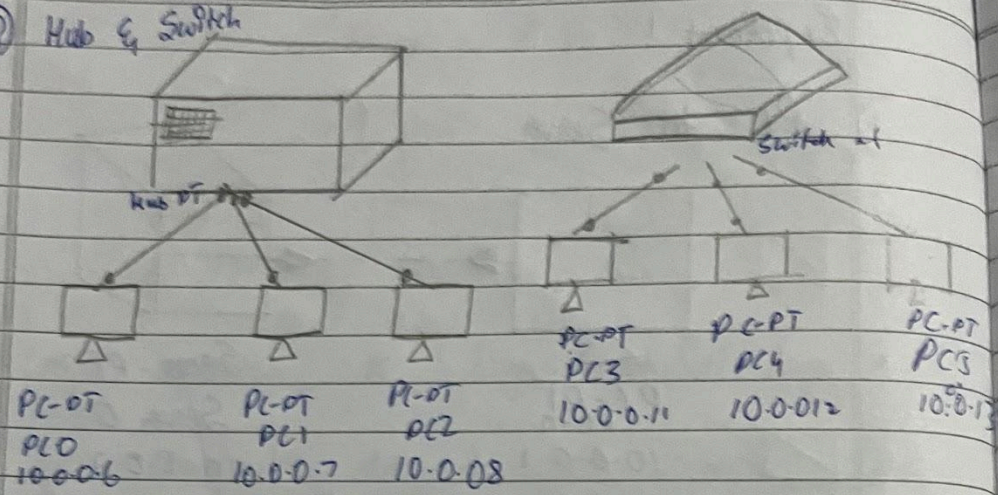
Server-PT Server 0 10.0.0.2

Aim:- To set up a point to point network b/w a PC and a server, facilitating direct communication to observe data exchange

Topology:- A PC is connected to server using a crossover ethernet cable.
IP address of PC- 10.0.0.1, Server - 10.0.0.2

Observation:-
Direct communication allows PC to communicate with server, which is typically in small networks for tasks such as file sharing, service request or testing server response to client response.

2) Hub & Switch



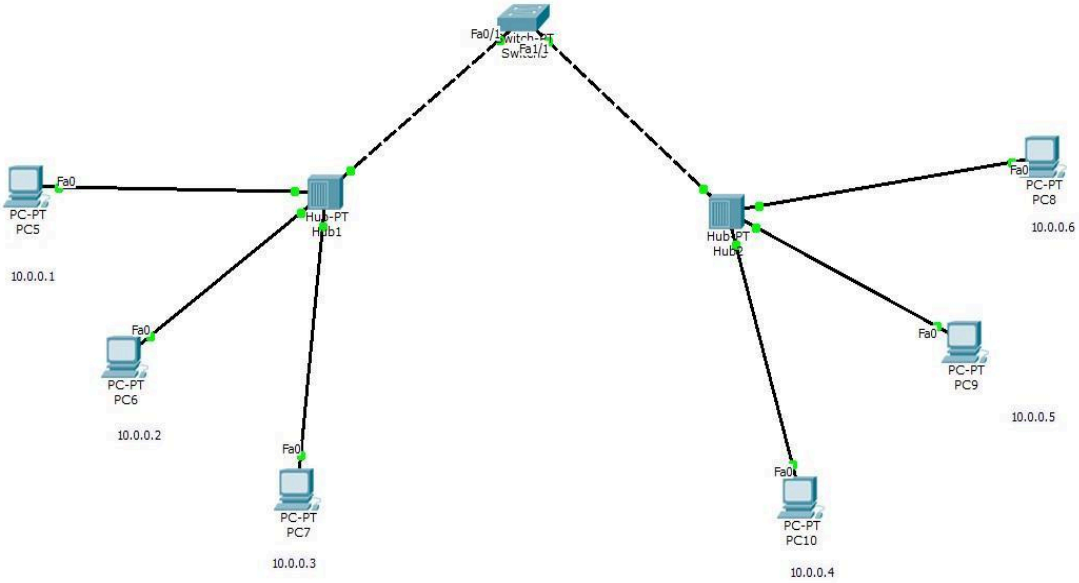
Aim:- To create Sample network consisting of 3 PC connected to a central hub and another network with 3 PC's connected to Switch this connection will help observe the behaviour of data transmission using hub & Switch.

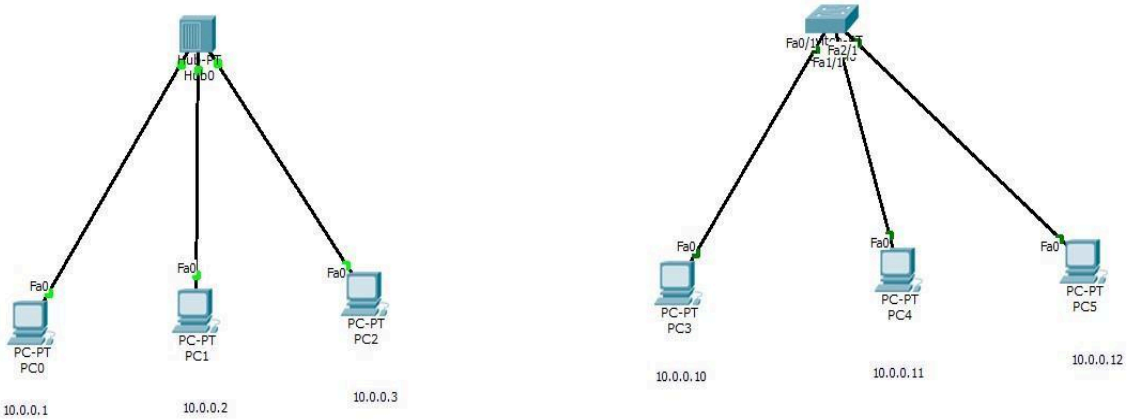
Topology:- 3 PC's are connected to a hub & Switch using straight through ethernet cables.

Observation:- Hub broadcasts packets to all devices. may cause through unnecessary traffic.

Switch forwards packets only to appropriate device by learning MAC addresses, using it more efficient by reducing traffic.

Screen Shots:

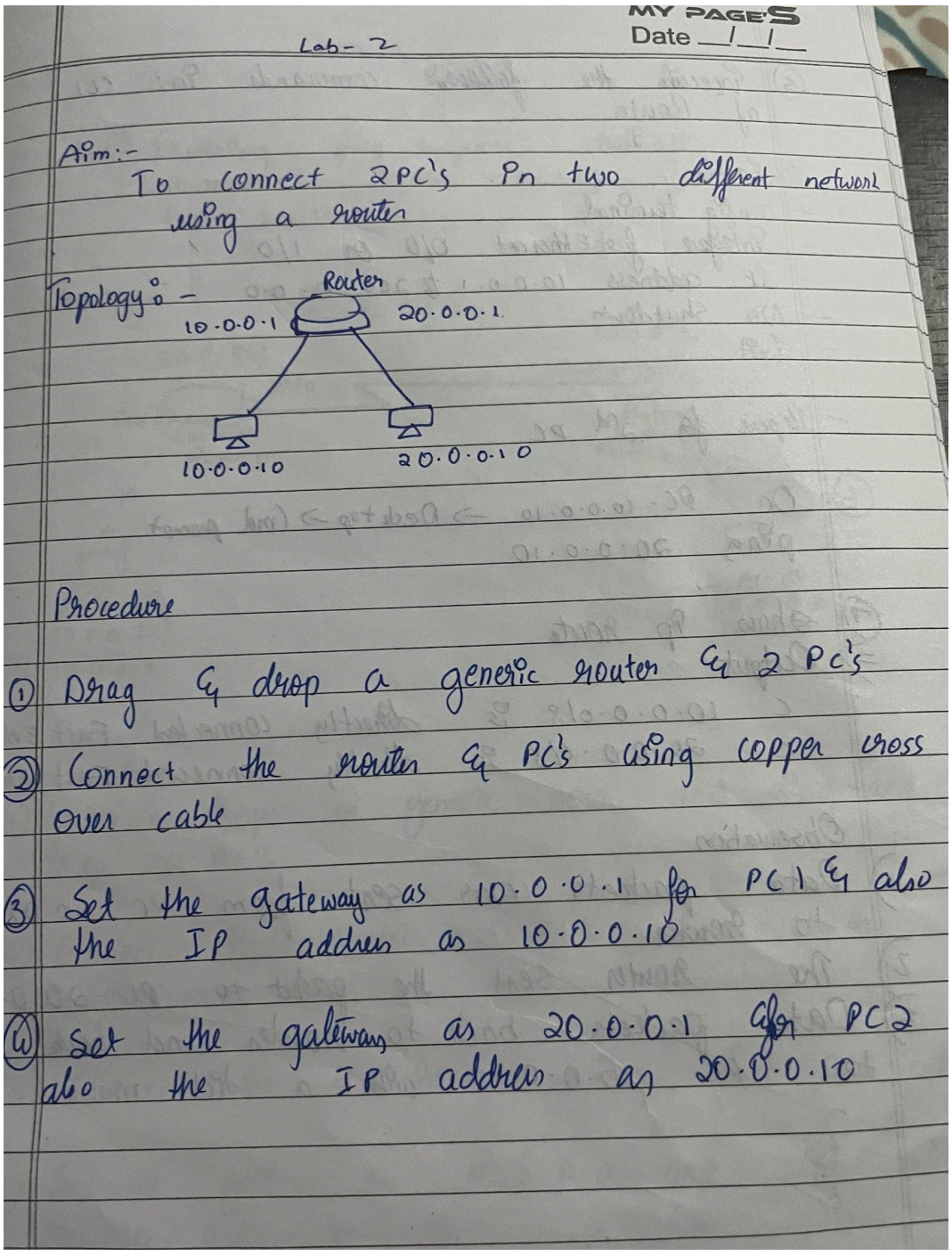


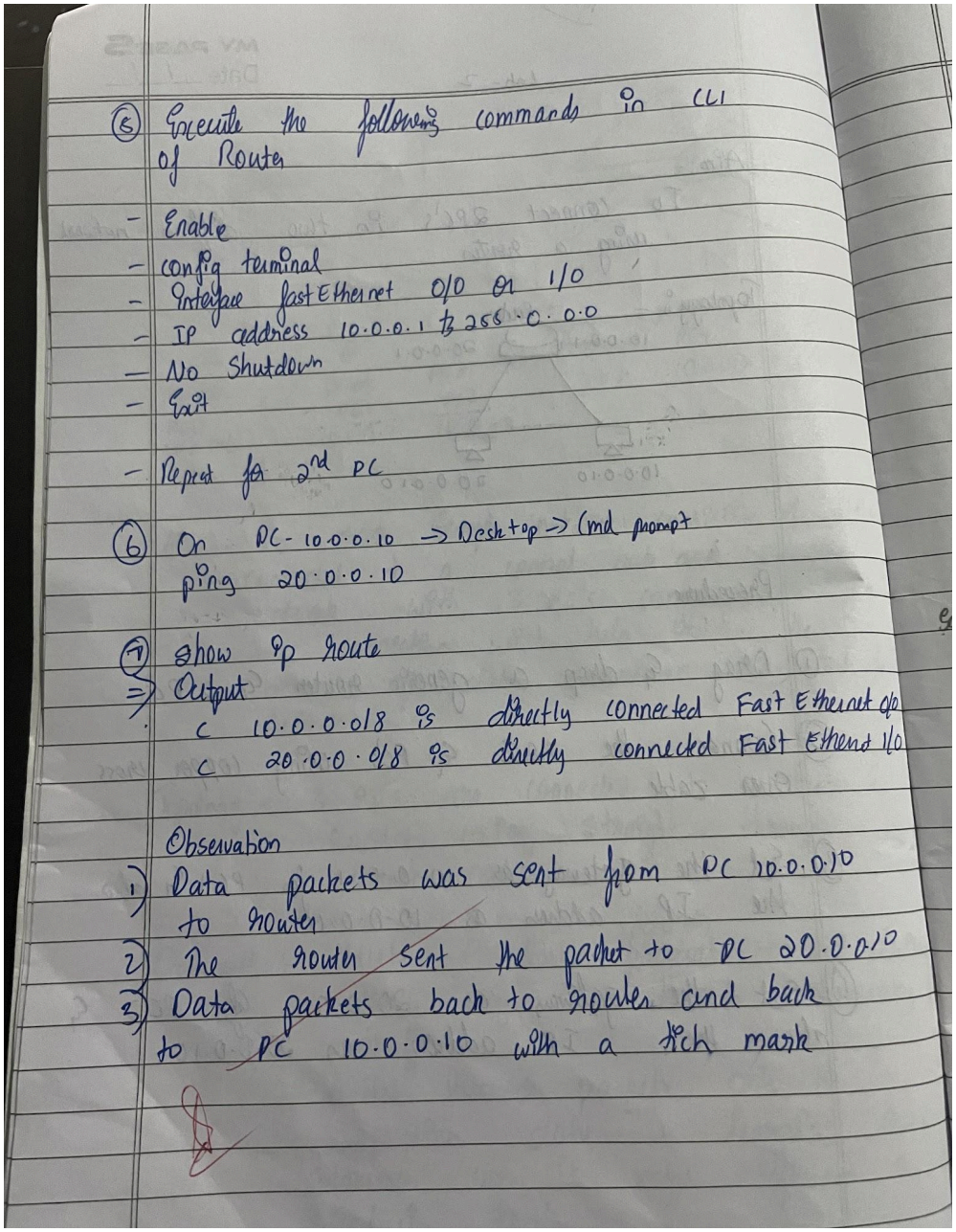


Program 2

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

Topology , Procedure and Observation:





⑤ Execute the following commands in CLI of Router

- Enable
- config terminal
- Interface fast Ethernet 0/0 or 1/0
- IP address 10.0.0.1 & 255.0.0.0
- No shutdown
- Exit

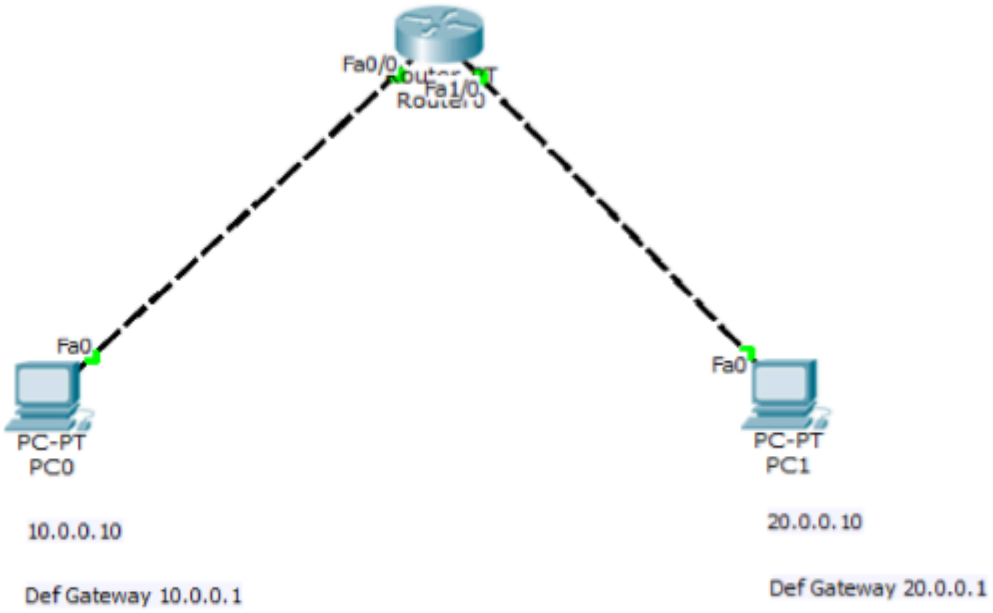
- Repeat for 2nd PC

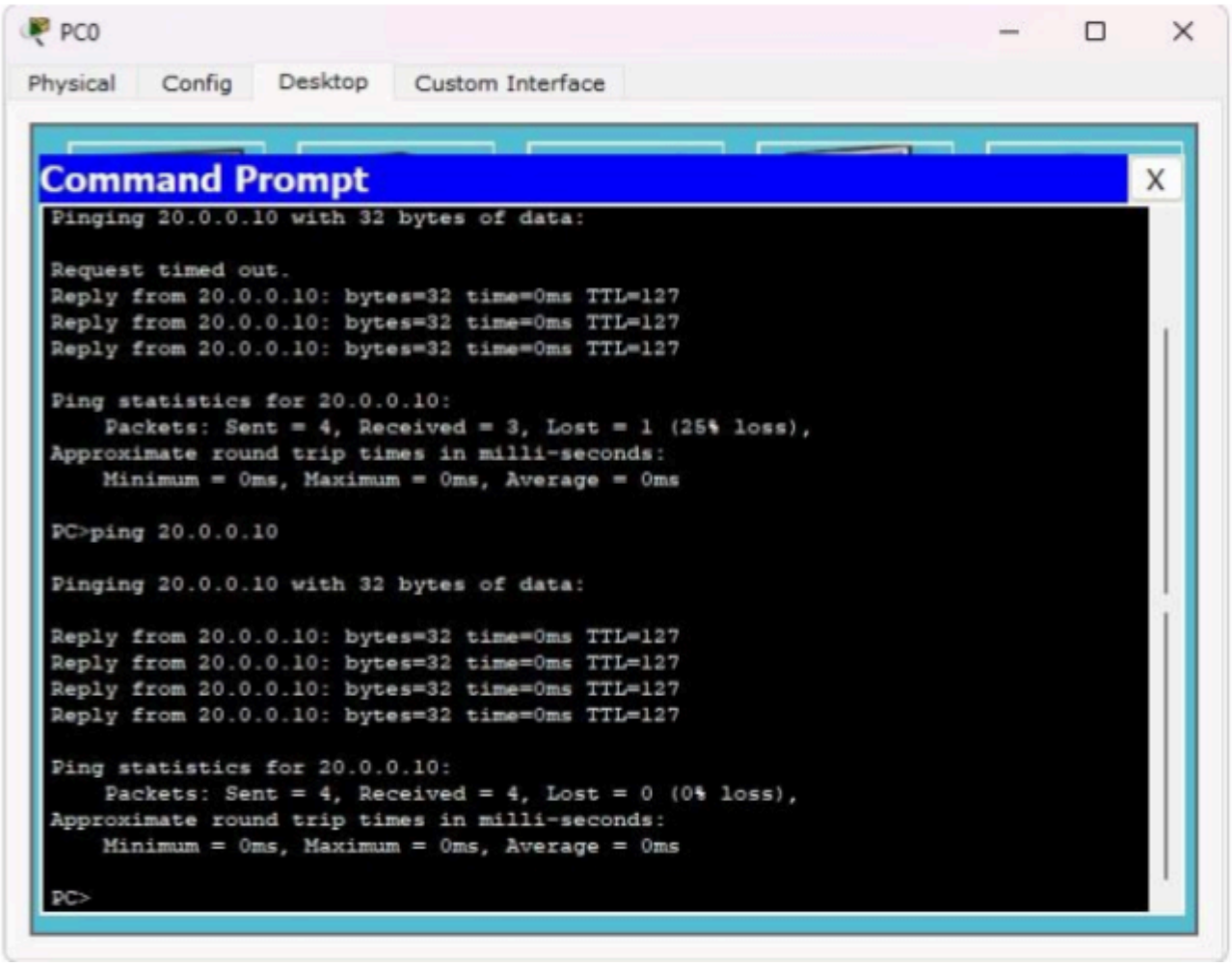
⑥ On PC - 10.0.0.10 → Desktop → Cmd prompt
ping 20.0.0.10

⑦ show ip route
=> Output
C 10.0.0.0/8 is directly connected Fast Ethernet 0/0
C 20.0.0.0/8 is directly connected Fast Ethernet 1/0

Observation
1) Data packets was sent from PC 10.0.0.10 to router
2) The router sent the packet to PC 20.0.0.10
3) Data packets back to router and back to PC 10.0.0.10 with a 4th mark

Screen Shots:

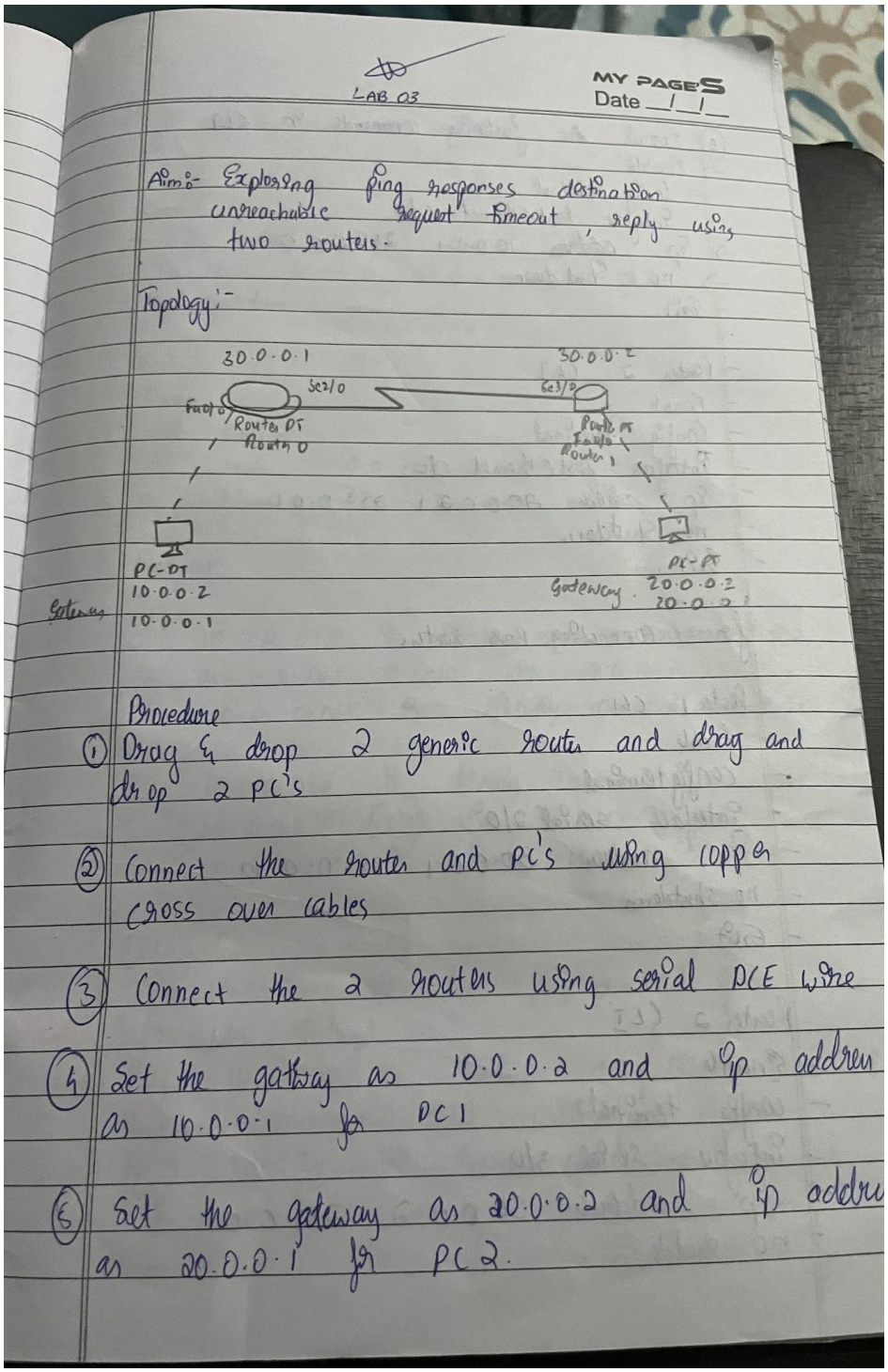




Program 3

Aim: Configure default route, static route to the Router(Part 1).

Topology , Procedure and Observation:



(6) Execute the following commands on CLI

=> Enable
=> Config terminal
=> Interface fast Ethernet 0/0
=> ip address 10.0.0.1 255.0.0.0
=> no Shut down
- Exit.

- Router 2 CLI
- Enable
- Config terminal
- Interface fast Ethernet 0/0
- ip address 20.0.0.2 1 255.0.0.0
- no Shutdown
- Exit

for connecting Both routers

Router 1 CLI
- Enable
- config terminal
- interface serial 2/0
- ip address 30.0.0.1 255.0.0.0
- no shutdown
- Exit

Router 2 CLI
- Enable
- config terminal
- interface serial 3/0
- ip address 30.0.0.2 255.0.0.0
- no shutdown.

MY PAGES
Date __/__/__

for connecting 10.0.0.1 to 20.0.0.1

- Router 1 CLI
- Enable
- config terminal
- ip route 20.0.0.0 255.0.0.0 30.0.0.2
- no shutdown

Router 2 CLI
- Enable
- config terminal
- ip route 10.0.0.0 255.0.0.0 30.0.0.1
- no shutdown.

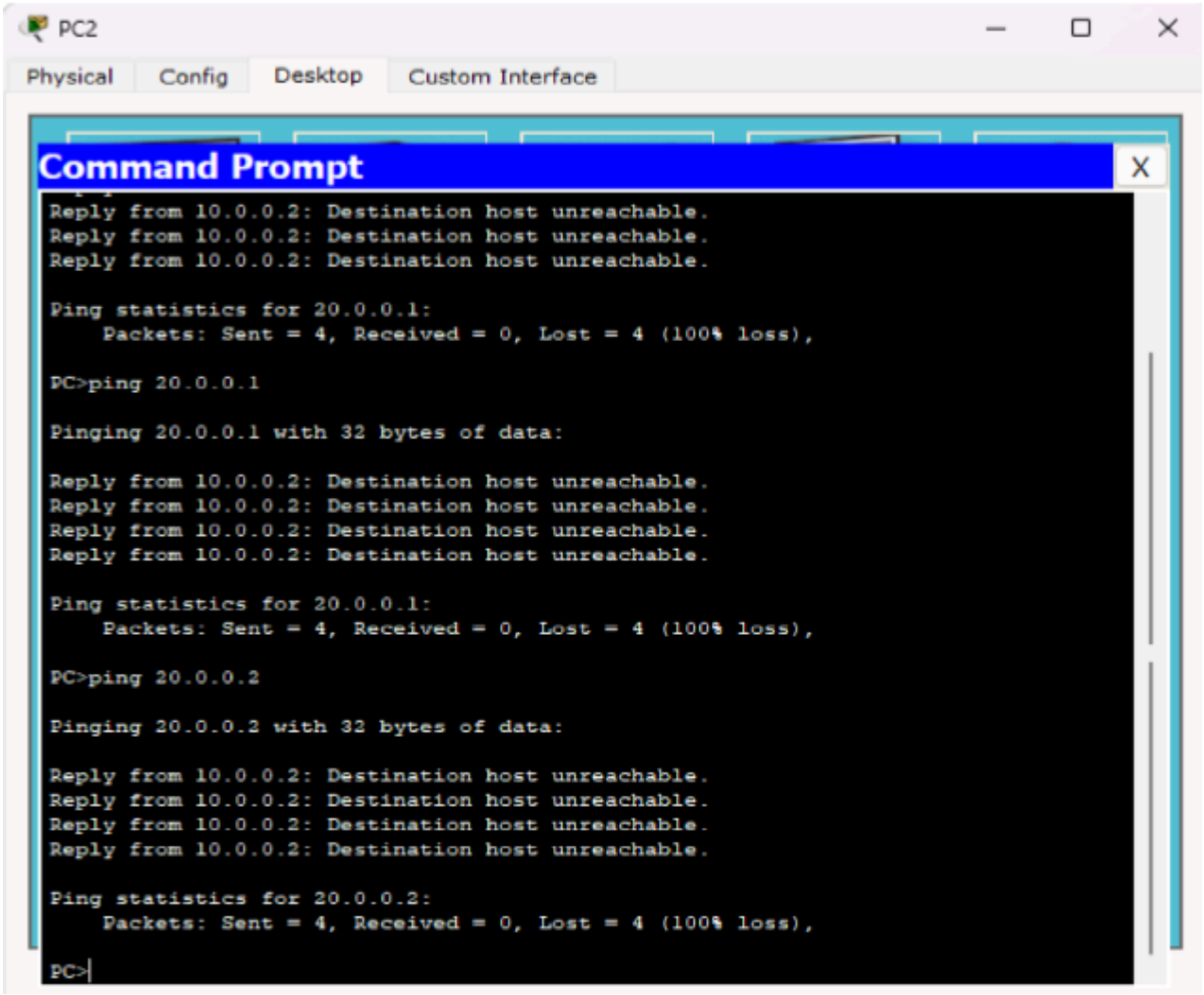
Output

C 10.0.0.0/8 is directly connected, FastEthernet 0/0
S 20.0.0.0/8 [1/0] via 30.0.0.2
C 30.0.0.0/8 is directly connected, serial 2/0

C 10.0.0.0/8 is directly connected
S 20.0.0.0/8 [1/0] via 30.0.0.2
C 30.0.0.0/8 is directly connected, Serial 2/0

Observation
1) The connection were done properly and green lights were displayed.
2) Ping 10.0.0.1 to 30.0.0.1 and 10.0.0.1 worked where as 20.0.0.1 didnt work from PC1
3) for resolving this issue we have to use ip route with 20.0.0.1 from Router 1 for connecting it once connected it works.

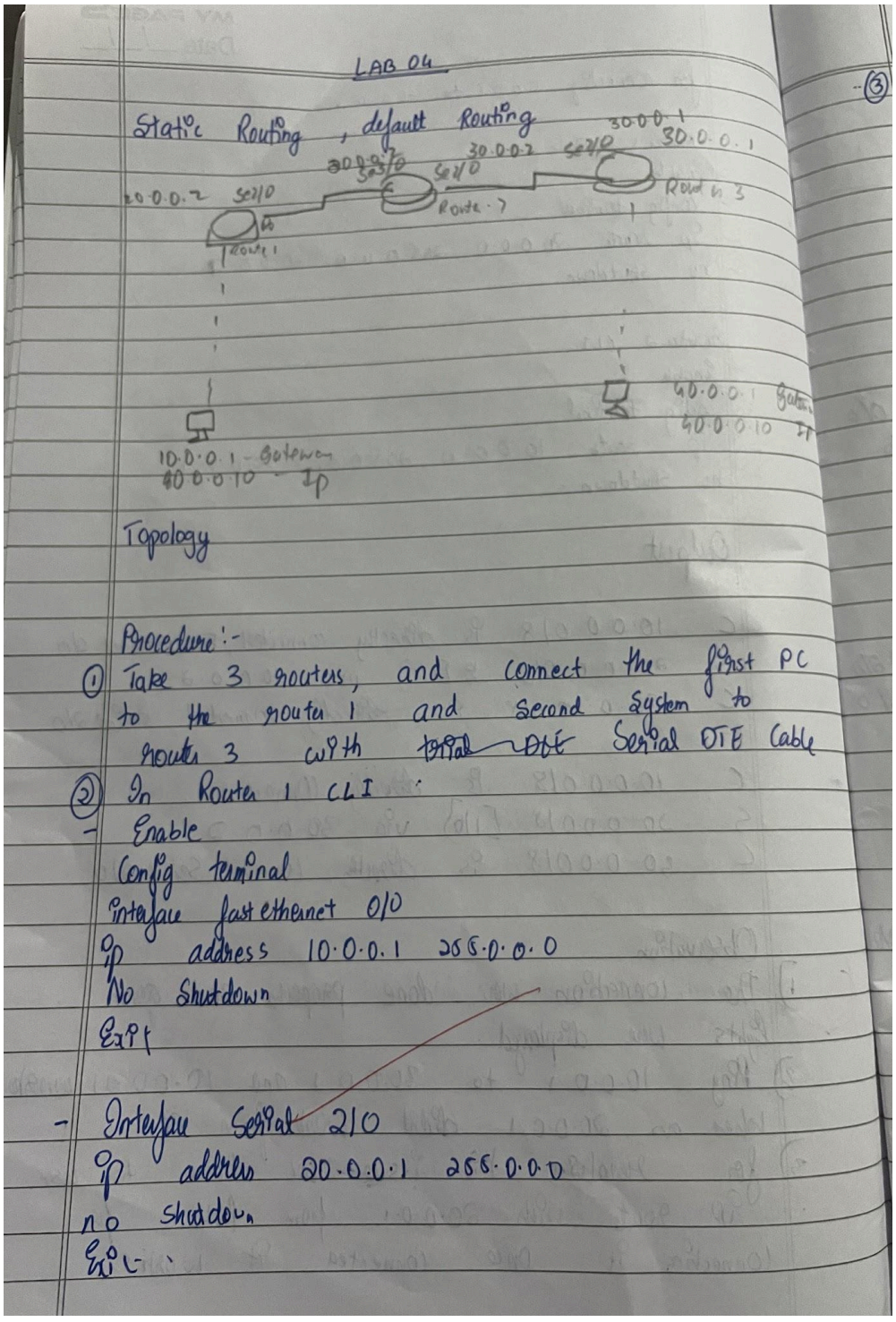
Screen Shots:

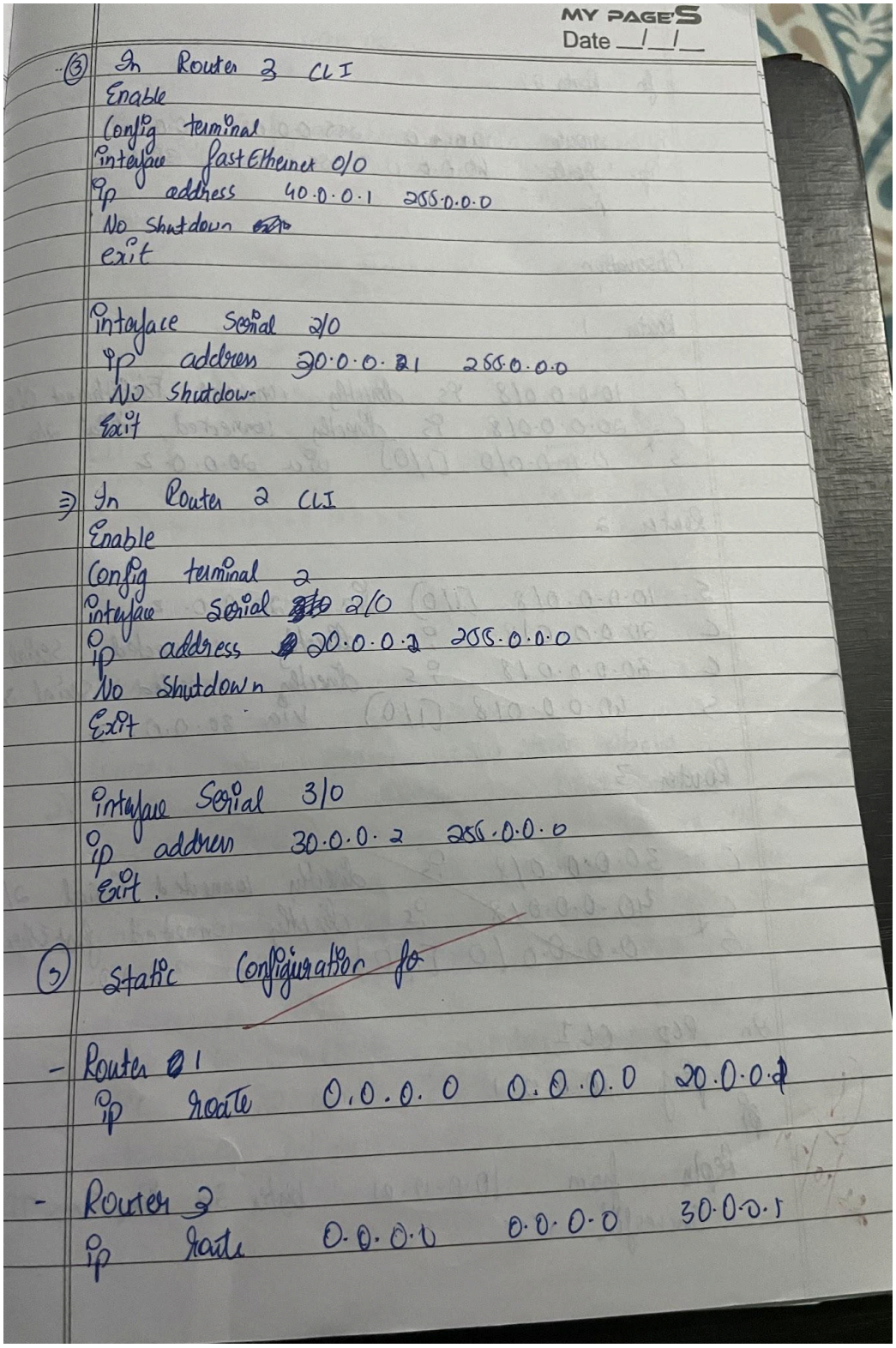


Program 4

Aim: Configure default route, static route to the Router(Part 2).

Topology , Procedure and Observation:





MY PAGES
Date __/__/__

③ In Router 3 CLI
Enable
Config terminal
interface fastEthernet 0/0
ip address 40.0.0.1 255.0.0.0
No shutdown
exit

interface Serial 2/0
ip address 30.0.0.21 255.0.0.0
No shutdow
Exit

⇒ In Router 2 CLI
Enable
Config terminal 2
interface Serial 2/0
ip address 20.0.0.2 255.0.0.0
No shutdown
Exit

interface Serial 3/0
ip addres 30.0.0.2 255.0.0.0
Exit.

⑤ Static Configuration fo

- Router 1
ip route 0.0.0.0 0.0.0.0 20.0.0.1

- Router 2
ip route 0.0.0.0 0.0.0.0 30.0.0.1

for Router 2:

ip route 10.0.0.0 255.0.0.0 20.0.0.1
ip route 40.0.0.0 255.0.0.0 30.0.0.1

Observation

Router 1

C 10.0.0.0/8 is directly connected FastEthernet 0/0
C 20.0.0.0/8 is directly connected, Serial 2/0
S* 0.0.0.0/0 [1/0] via 20.0.0.2

Router 2

S 10.0.0.0/8 [1/0] via 20.0.0.2
C 20.0.0.0/8 is directly connected Serial 2/0
C 30.0.0.0/8 is directly connected Serial 3/0
S 40.0.0.0/8 [1/0] via 30.0.0.2

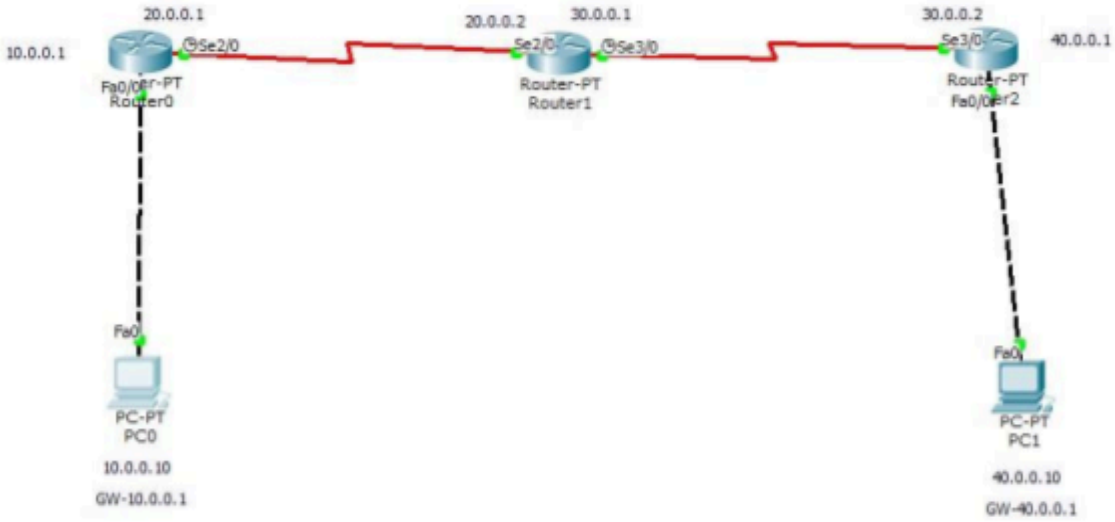
Router 3

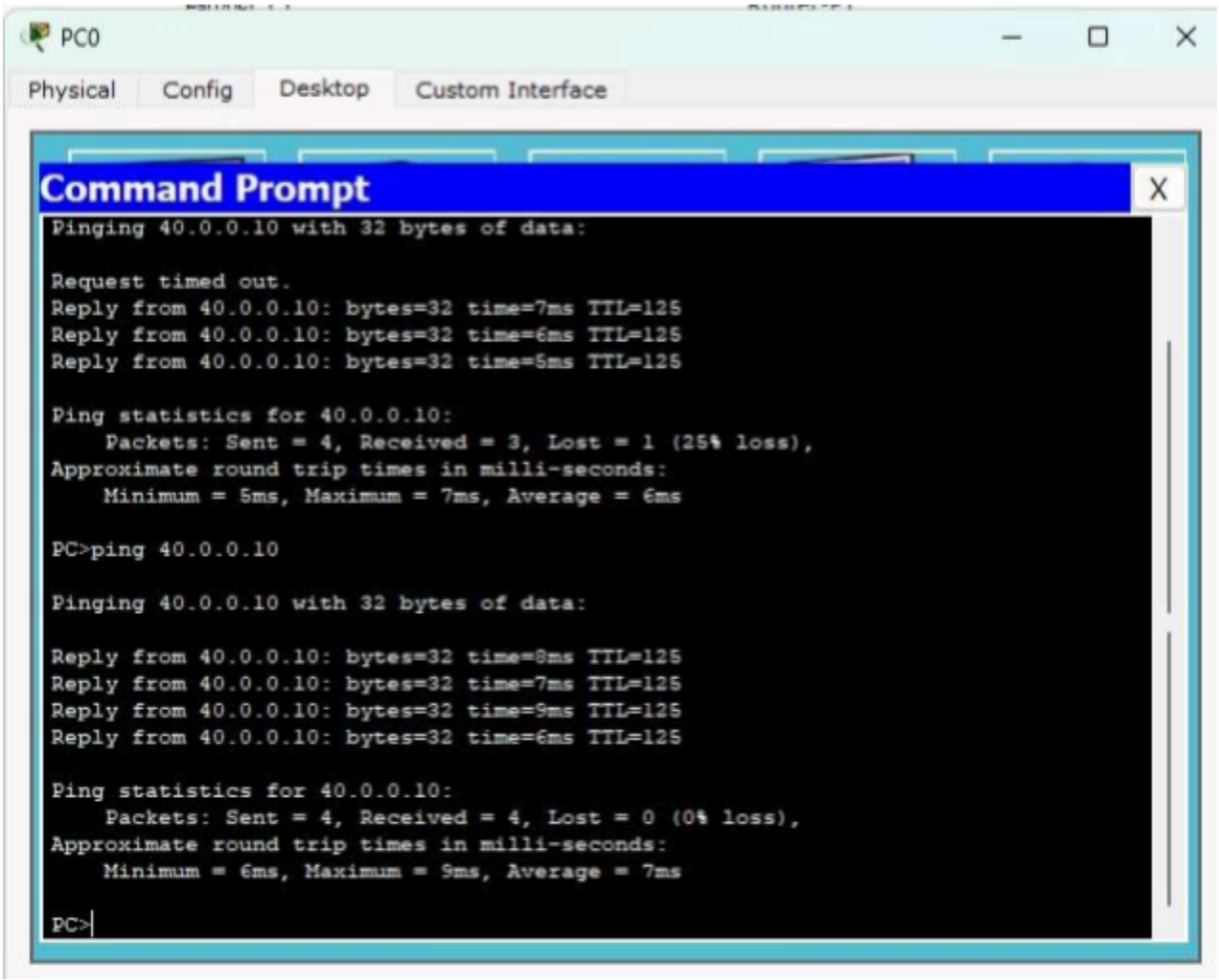
C 30.0.0.0/8 is directly connected Serial 2/0
C 40.0.0.0/8 is directly connected fastEthernet 0/0
S* 0.0.0.0/0 [1/0] via 30.0.0.1

On PC2 CLI

ping 10.0.0.1

Reply from 10.0.0.01 byte 32 time=5ms TTL=253
Successful

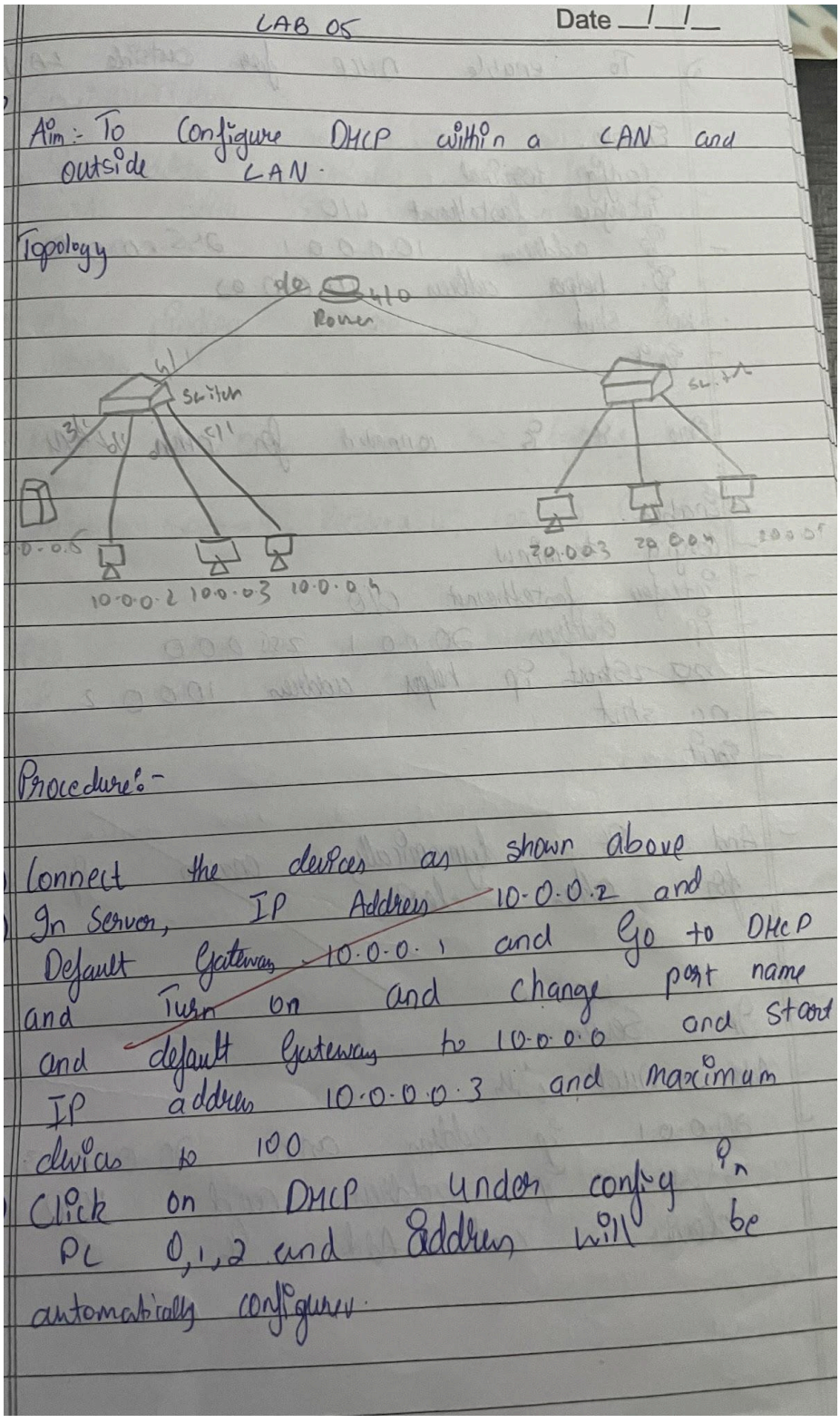

20.0.0.1
10.0.0.1
Se2/0
20.0.0.2
Se2/0
30.0.0.1
Se3/0
30.0.0.2
Se3/0
40.0.0.1
Router0
Router1
Router2
Fa0
PC-PT
PC0
10.0.0.10
GW-10.0.0.1
Fa0
PC-PT
PC1
40.0.0.10
GW-40.0.0.1

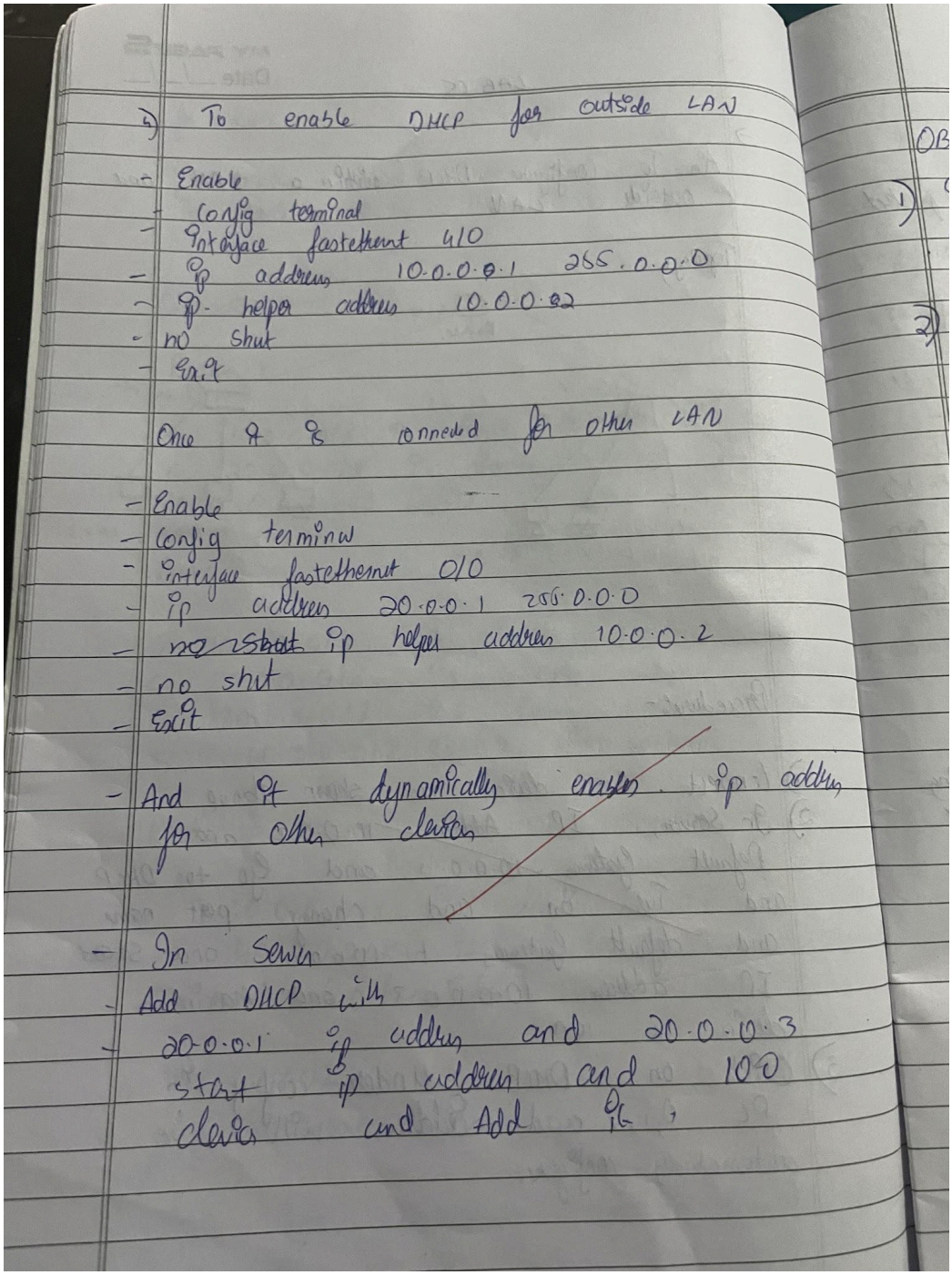

PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
Pinging 40.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125
Reply from 40.0.0.10: bytes=32 time=6ms TTL=125
Reply from 40.0.0.10: bytes=32 time=5ms TTL=125
Ping statistics for 40.0.0.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 5ms, Maximum = 7ms, Average = 6ms
PC>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 40.0.0.10: bytes=32 time=8ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125
Reply from 40.0.0.10: bytes=32 time=9ms 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 = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 6ms, Maximum = 9ms, Average = 7ms
PC>

Program 5

Aim: Configure DHCP within a LAN and outside LAN.

Topology , Procedure and Observation:





4) To enable DHCP for outside LAN

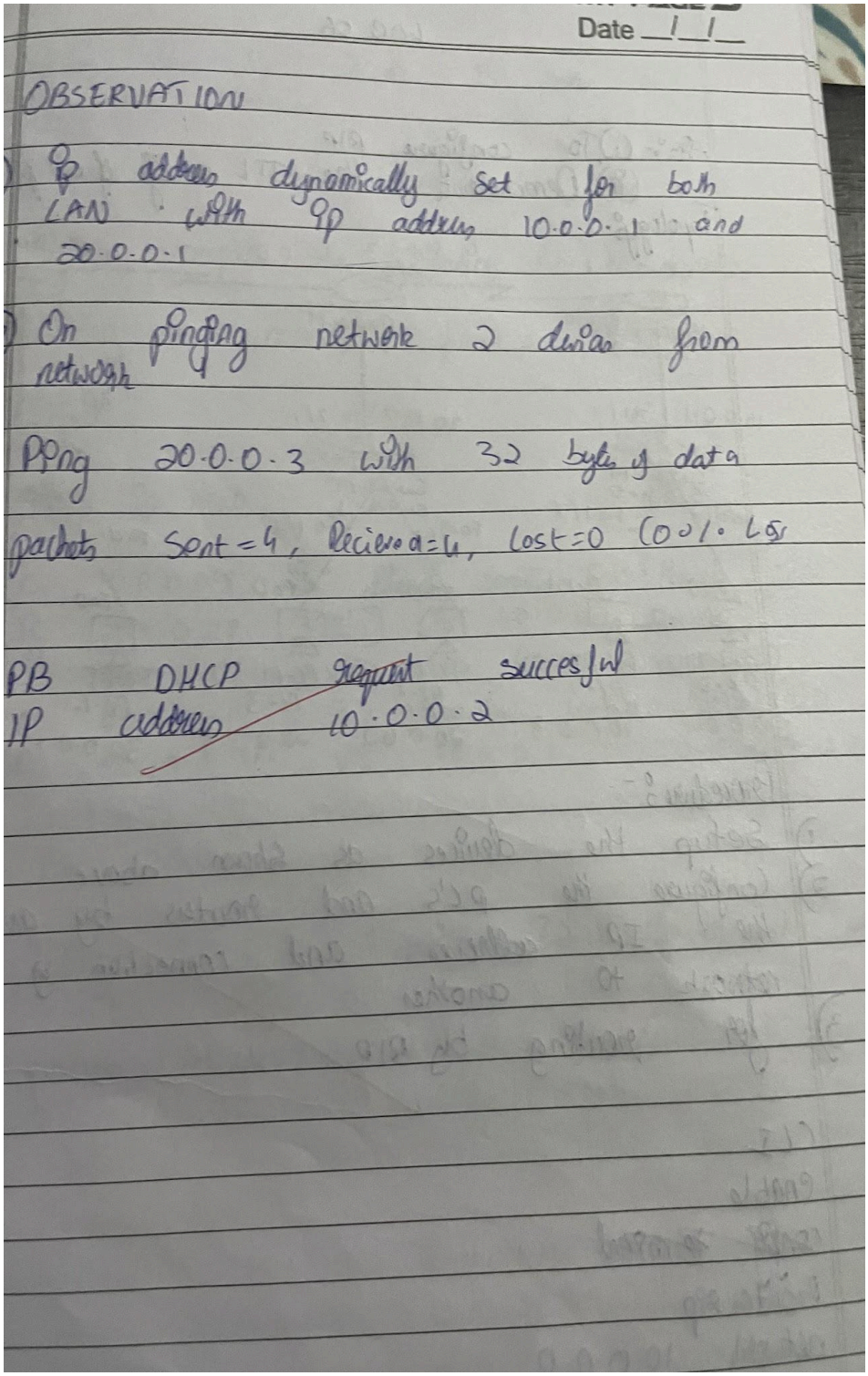
- Enable
- Config terminal
- Interface fastethernet 4/0
- ip address 10.0.0.0.1 255.0.0.0
- ip helper address 10.0.0.02
- no shut
- Exit

Once it is connected for other LAN

- Enable
- Config terminw
- interface fastethernet 0/0
- ip address 20.0.0.1 255.0.0.0
- ~~no shut~~ ip helper address 10.0.0.2
- no shut
- Exit

- And it dynamically enables ip addrs for other clients

- In Server
- Add DHCP with
- 20.0.0.1 ip address and 20.0.0.3 start ip address and 100 clients and Add it,


Date __/__/__

OBSERVATION

1) IP address dynamically set for both LAN with IP address 10.0.0.1 and 20.0.0.1

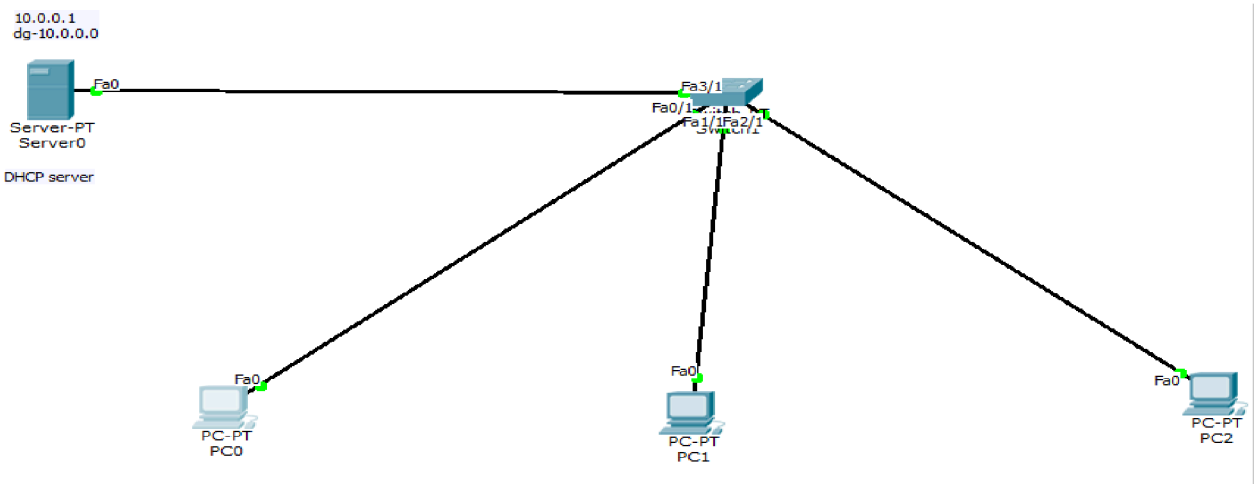
2) On pinging network 2 device from network

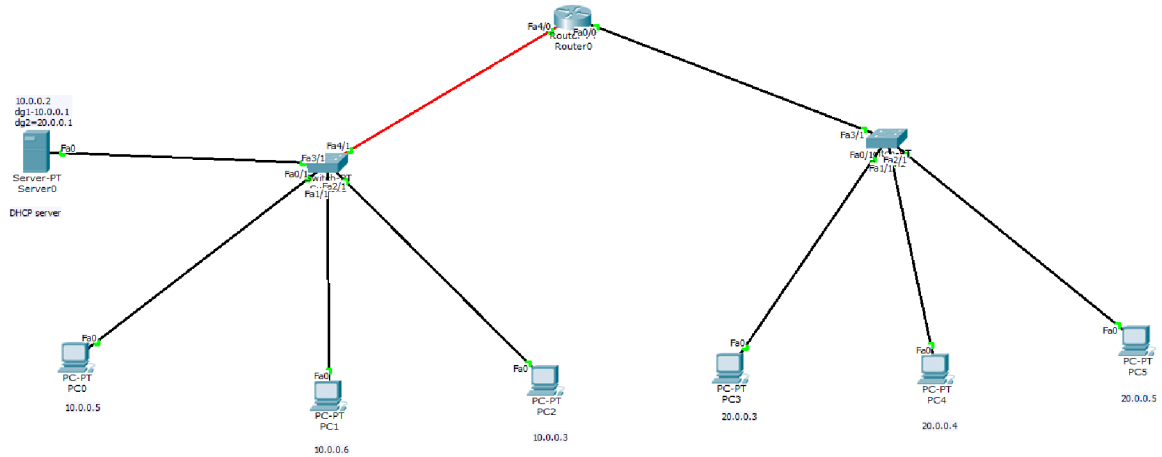
Ping 20.0.0.3 with 32 byte of data

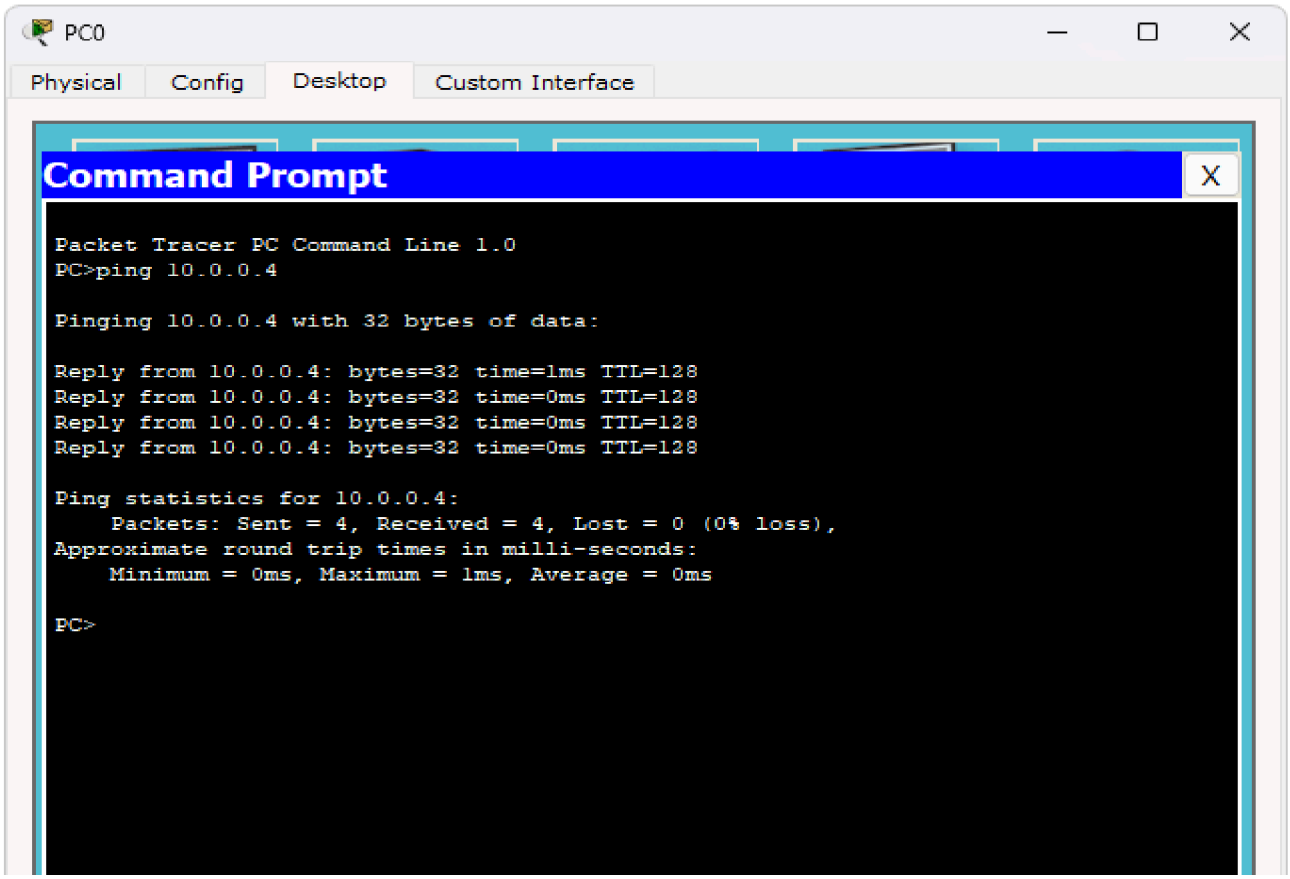
packets Sent = 4, Recieved = 4, Lost = 0 (0% Loss

PB DHCP request succesful
IP address 10.0.0.2

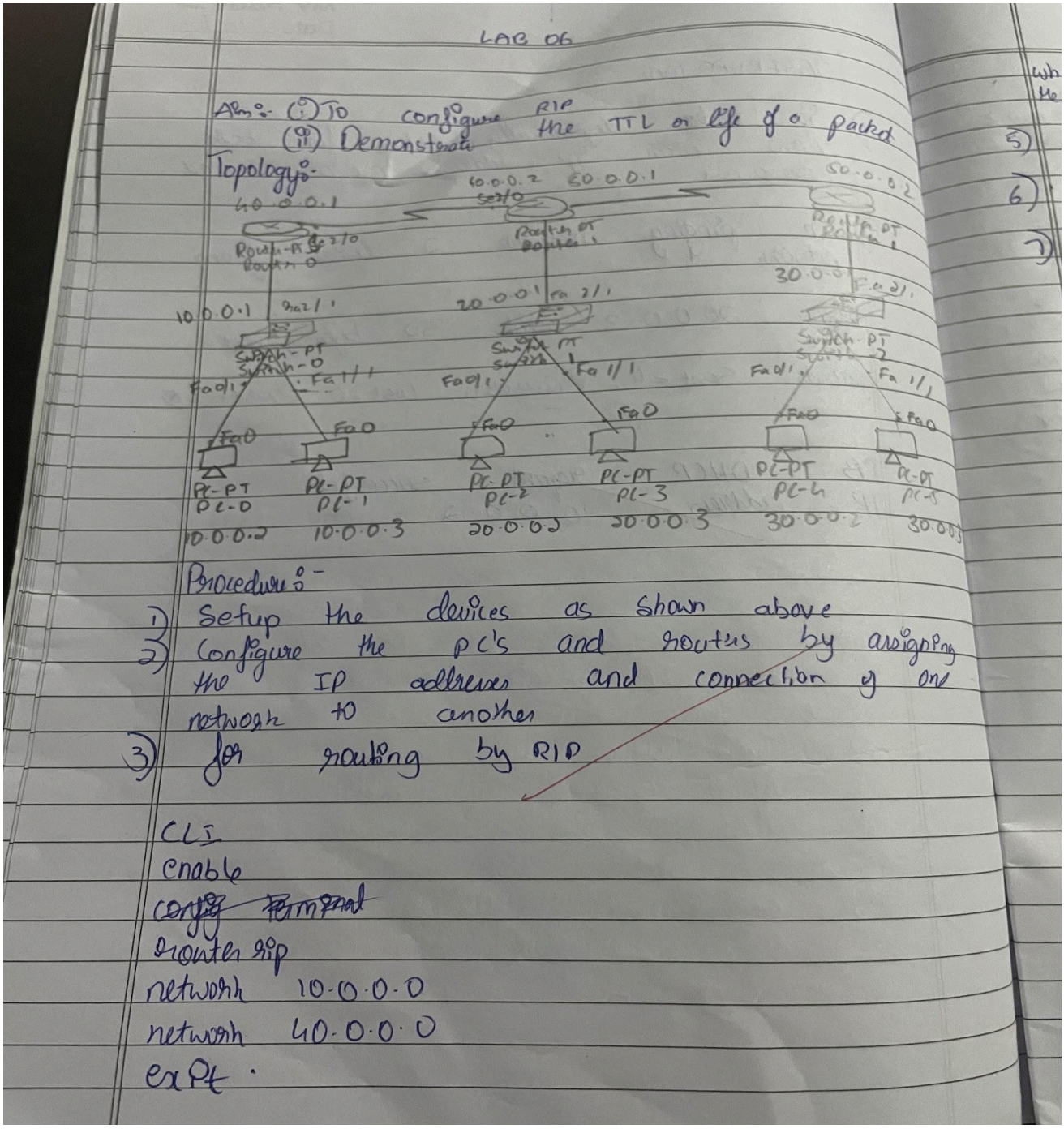
Screen Shots:






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=1ms 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 = 1ms, Average = 0ms
PC>

Program 6Aim:Configure RIP routing Protocol in Routers .Topology , Procedure and Observation:



MY PAGES
Date __/__/__

when show ip route is given a the next command

5) Repeat the same commands for other routers.

6) This completes the routing in the topology

7) Ping a message from a PC to PC

Output

Show ip route

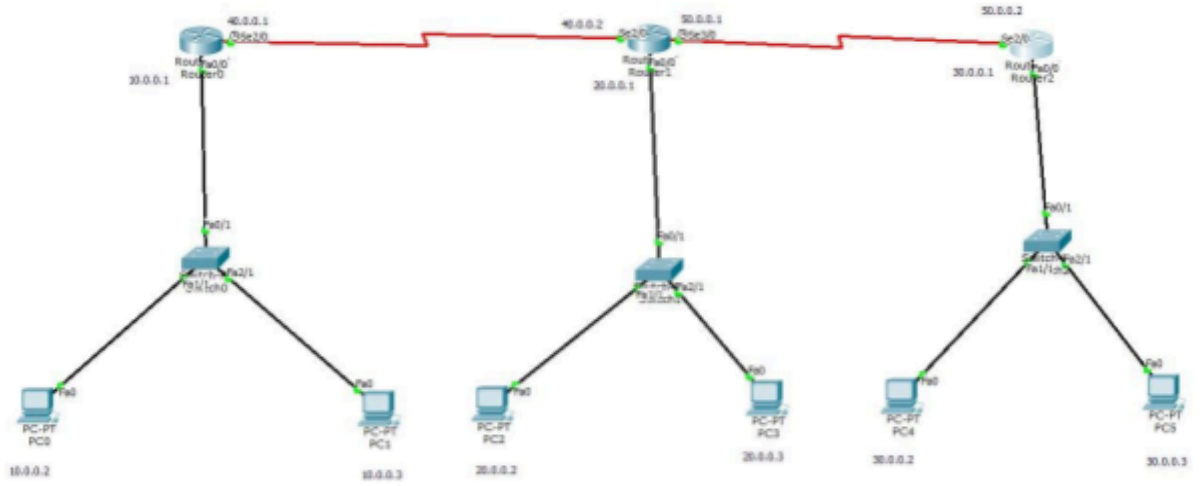
C 10.0.0.0/8 is directly connected FastEthernet 0/0
R 20.0.0.0/8 [120/1] via 40.0.0.2 00.00.11
R 30.0.0.0/8 [120/1] via 40.0.0.2 ,00.00.11
C 40.0.0.0/8 is directly connected Serial 2/0
R 50.0.0.0/8 via 40.0.0.2 ,00.00.11 ,Serial 2/0

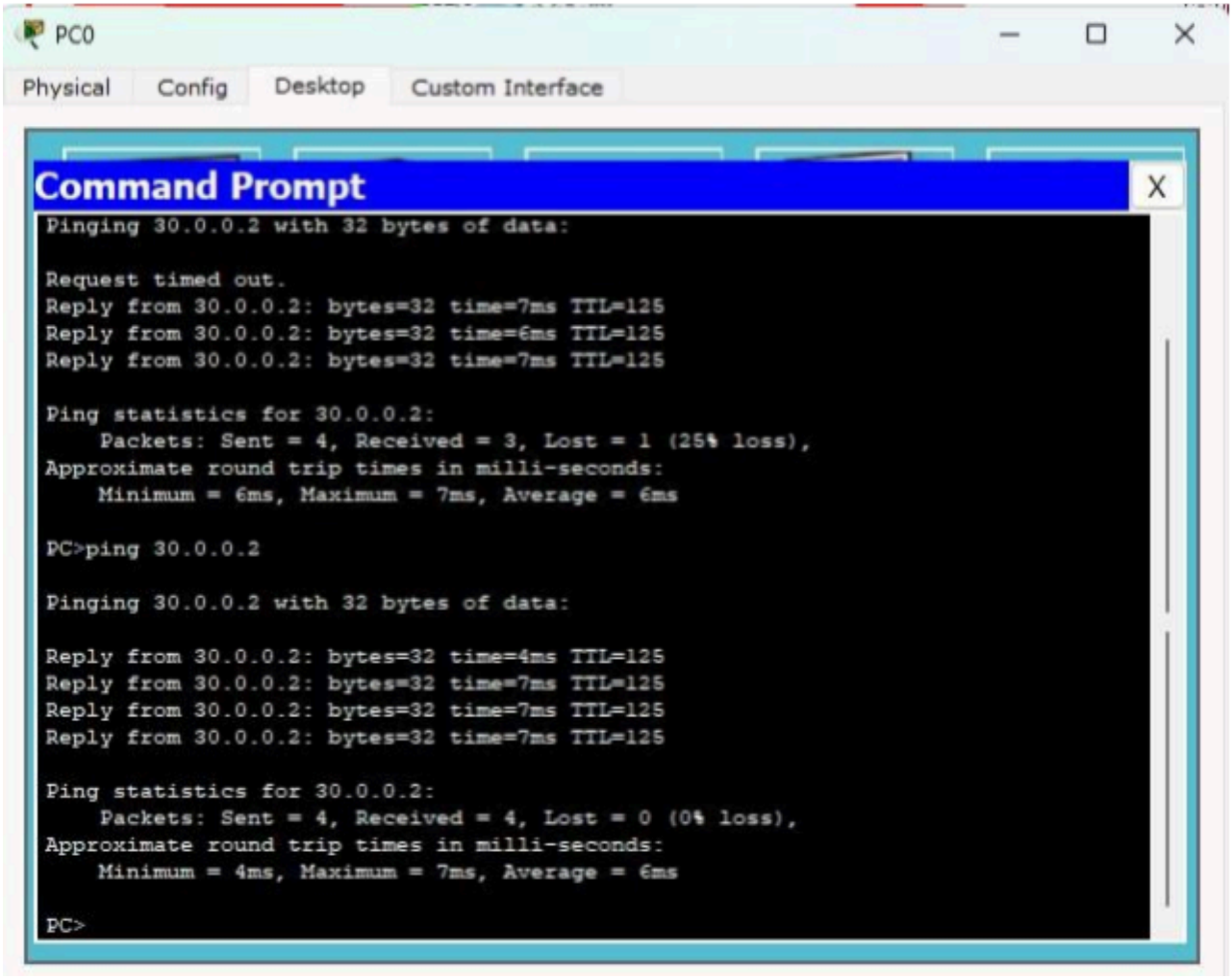
1) Ping 30.0.0.2

pinging 30.0.0.2 with 32 bytes of dat.

packets sent=4, received=4, Lost=0 (0% Loss)

Screen Shots:

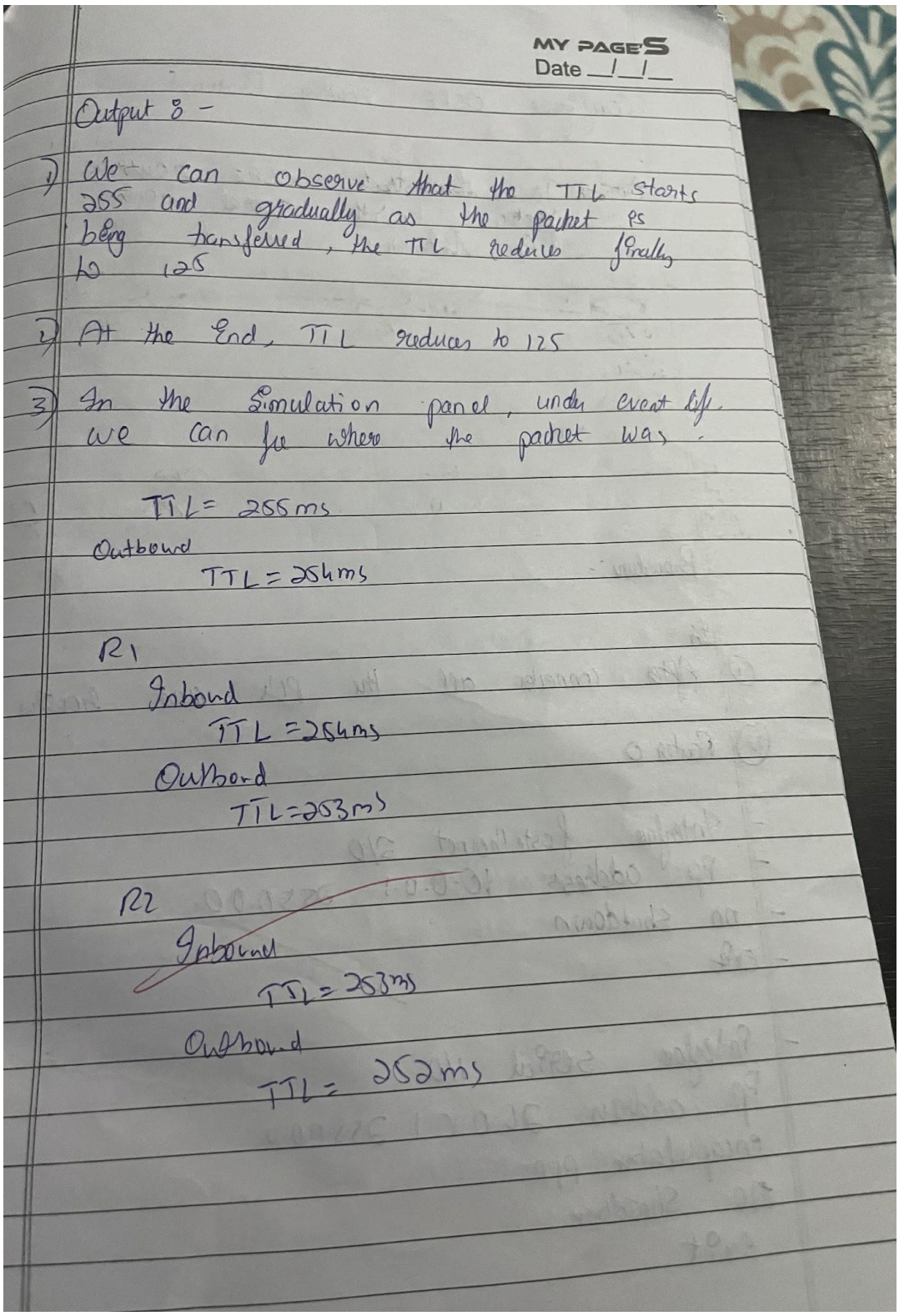


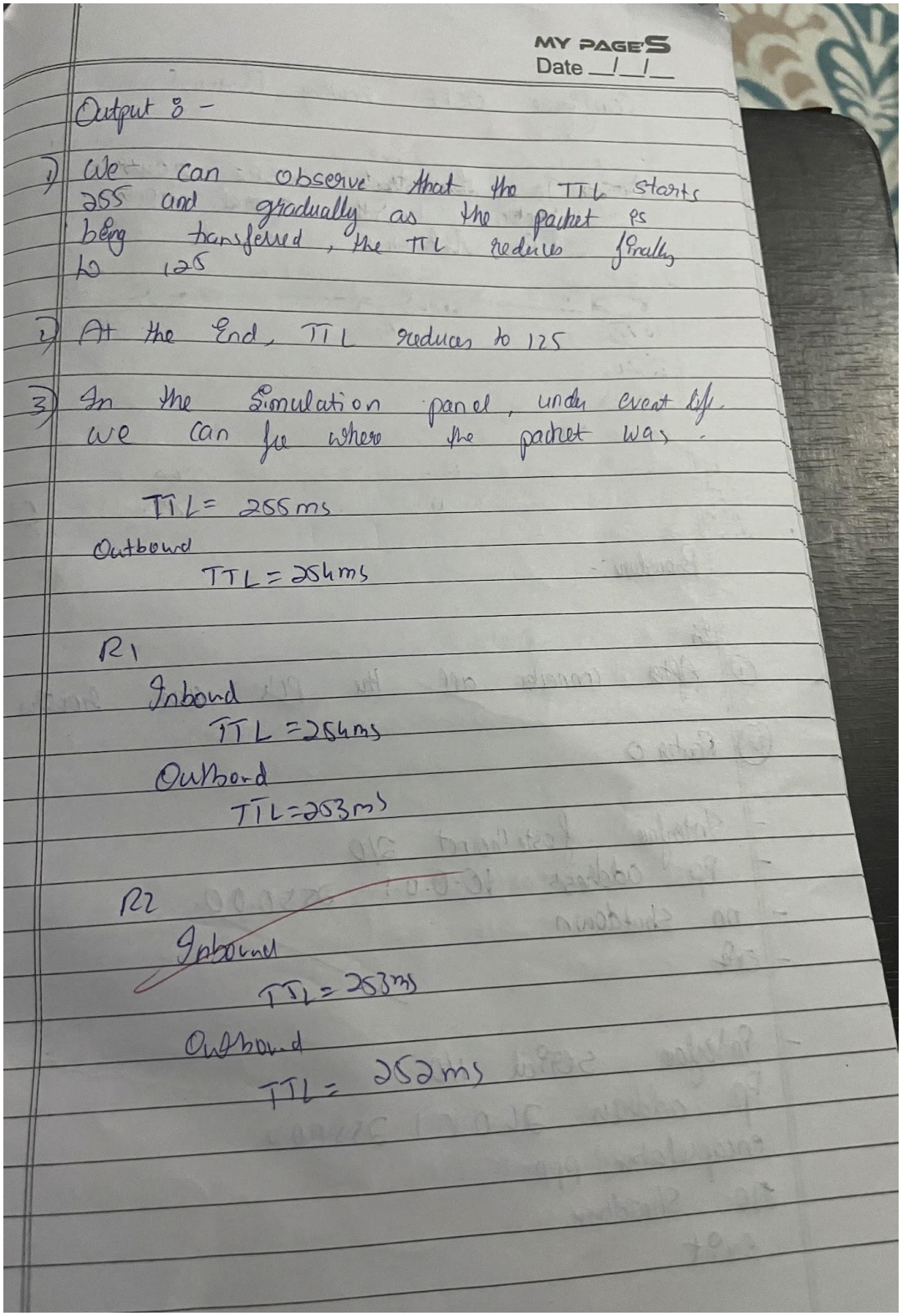


Program 7

Aim: Demonstrate the TTL/ Life of a Packet .

Topology , Procedure and Observation:





MY PAGES
Date __/__/__

Output :-

1) We can observe that the TTL starts 255 and gradually as the packet is being transferred, the TTL reduces finally to 125

2) At the End, TTL reduces to 125

3) In the Simulation panel, under event list we can see where the packet was.

TTL = 255 ms

Outbound

TTL = 254 ms

R1

Inbound

TTL = 254 ms

Outbound

TTL = 253 ms

R2

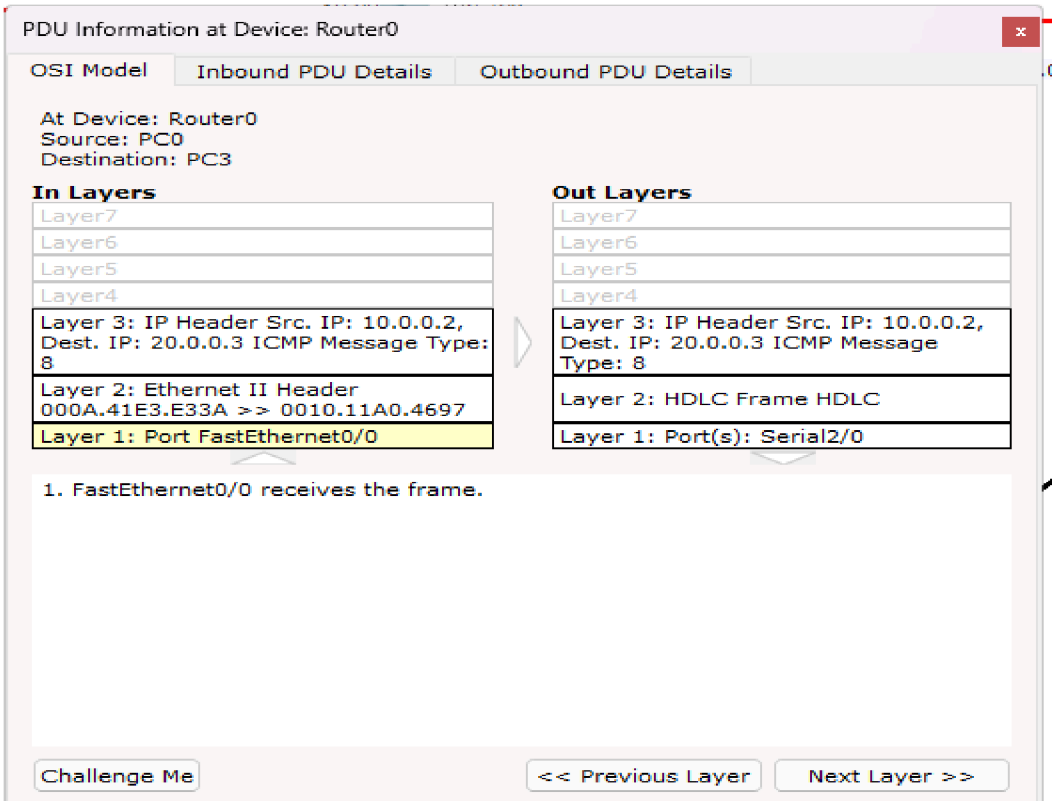
Inbound

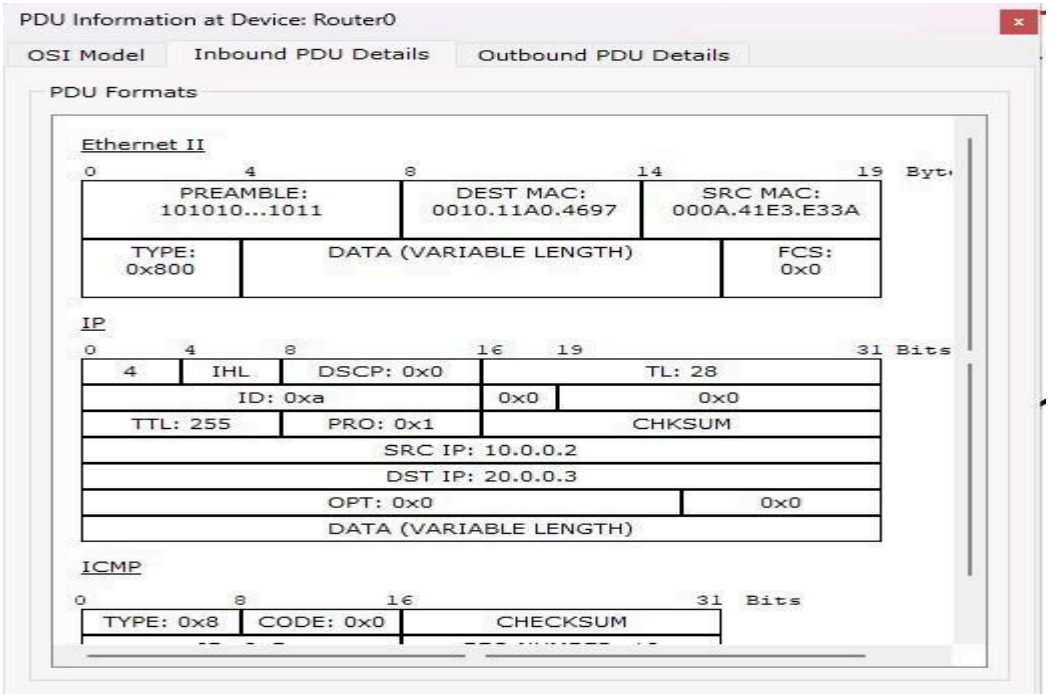
TTL = 253 ms

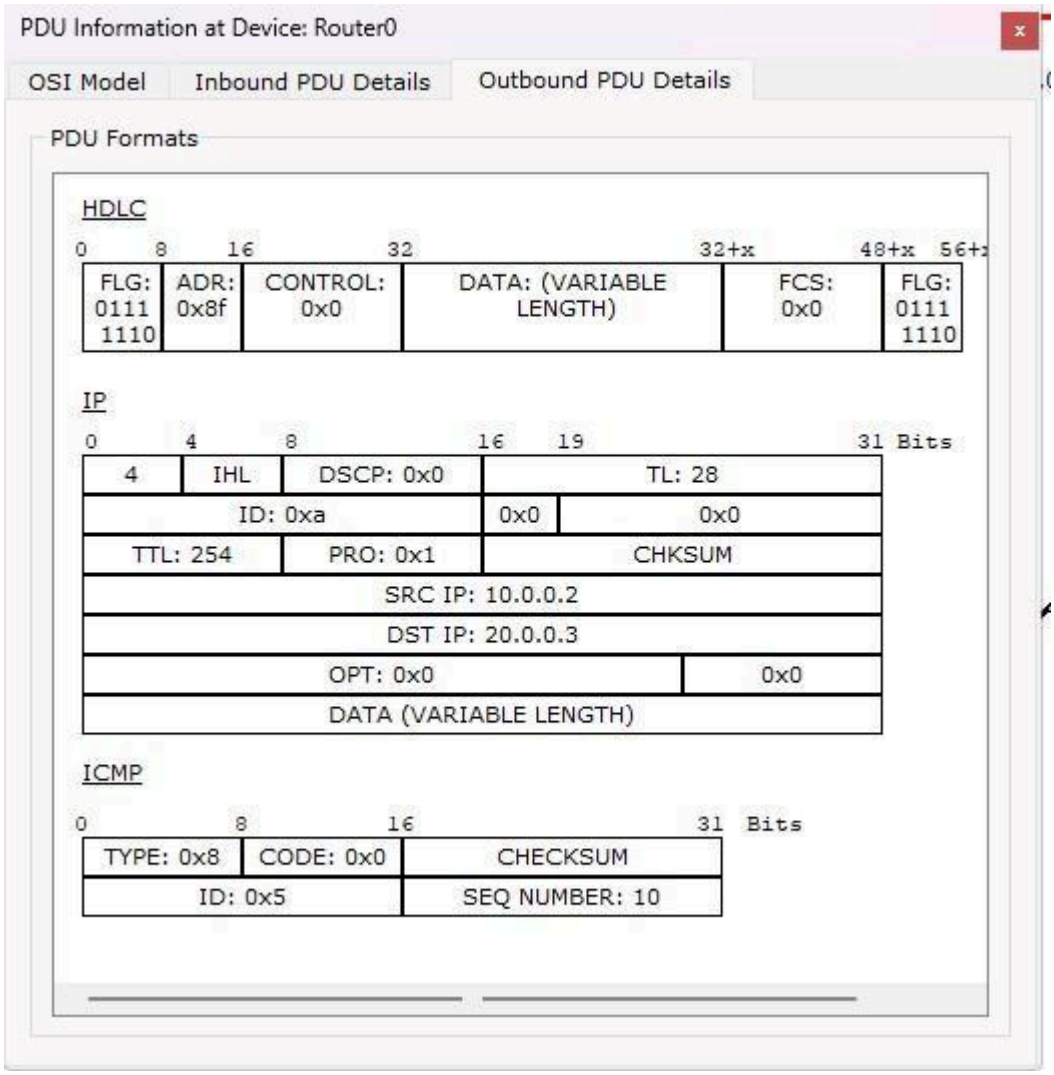
Outbound

TTL = 252 ms

Screen Shots:



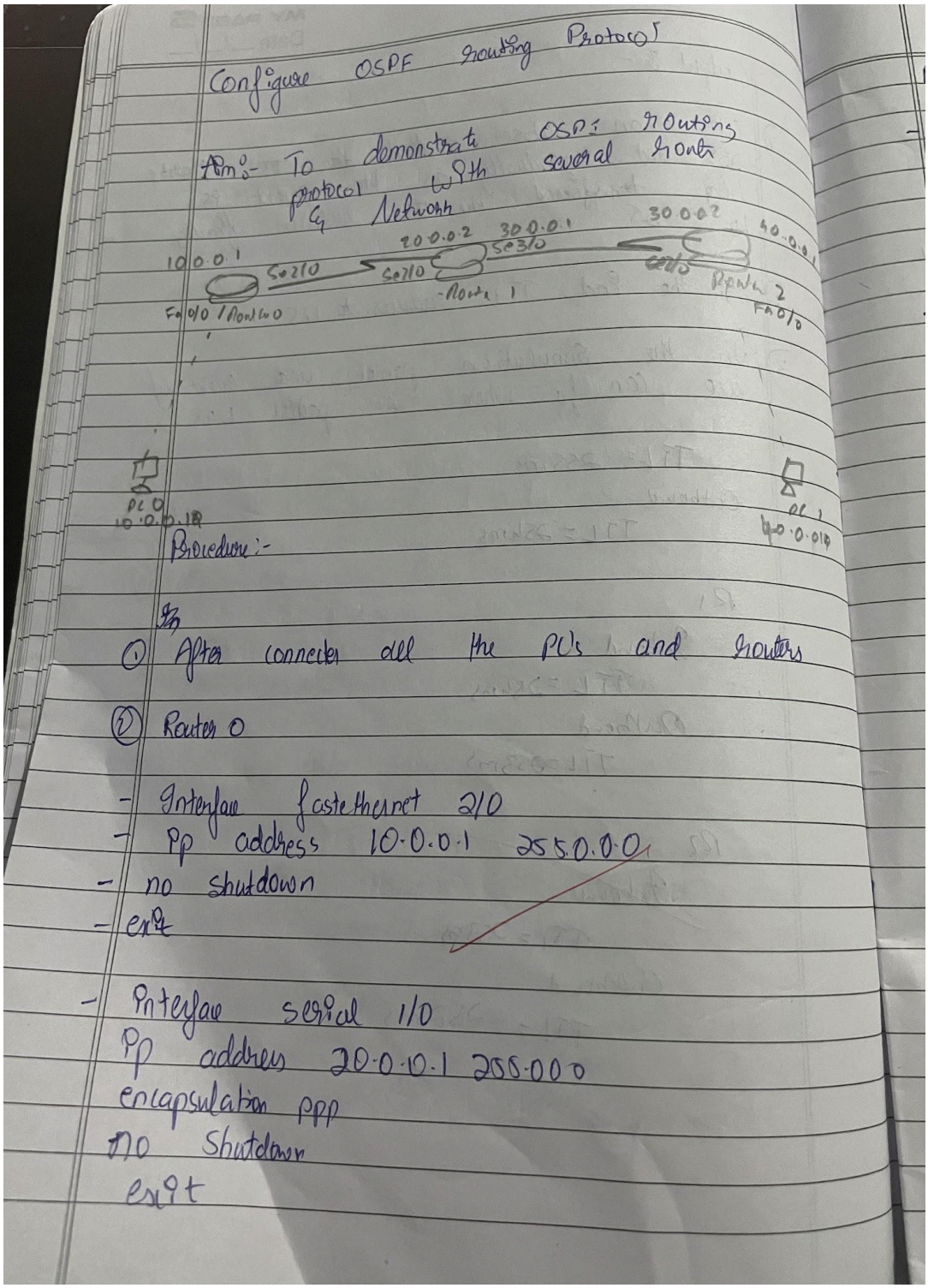


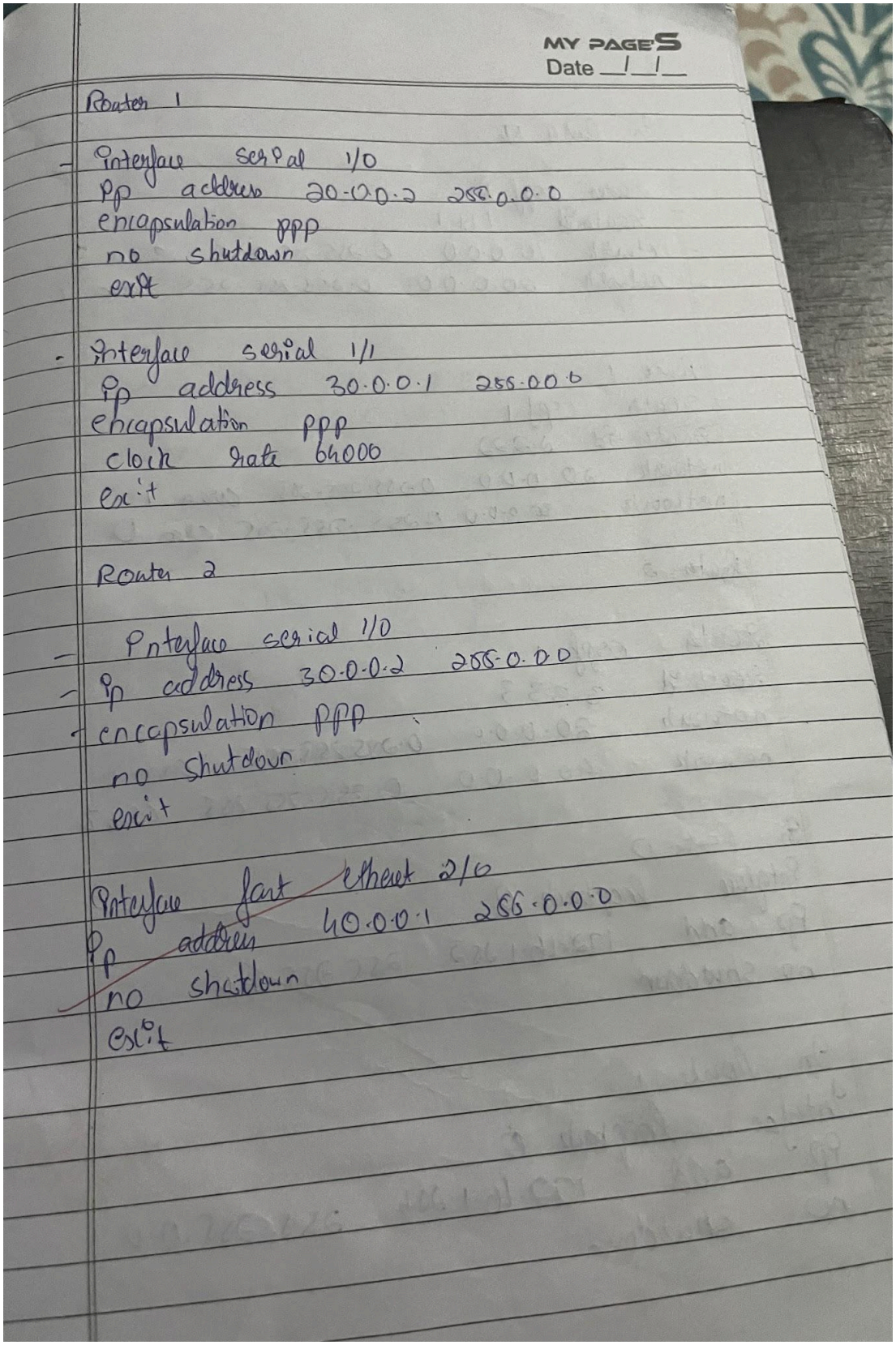

PDU Information at Device: Router0
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 56+x
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0xa
0x0
0x0
TTL: 254
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.2
DST IP: 20.0.0.3
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x5
SEQ NUMBER: 10

Program 8

Aim: Configure OSPF routing protocol .

Topology , Procedure and Observation:




MY PAGES
Date __/__/__

Router 1

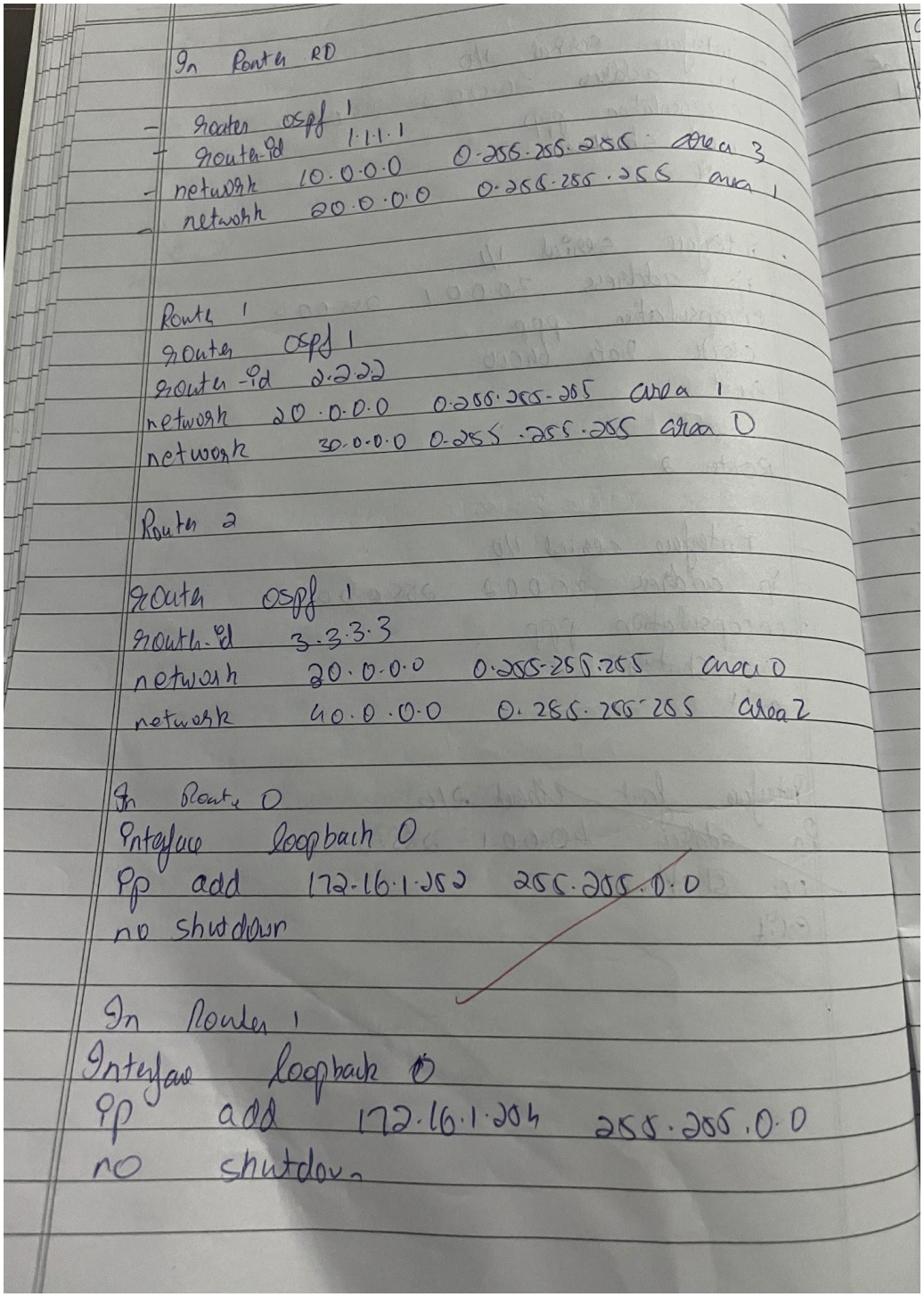
- Interface serial 1/0
ip address 20.0.0.2 255.0.0.0
encapsulation ppp
no shutdown
exit

- Interface serial 1/1
ip address 30.0.0.1 255.0.0.0
encapsulation ppp
clock rate 64000
exit

Router 2

- Interface serial 1/0
- ip address 30.0.0.2 255.0.0.0
- encapsulation ppp
no shutdown
exit

Interface fast ethernet 2/0
ip address 40.0.0.1 255.0.0.0
no shutdown
exit



In Router R0

- router ospf 1
- router-id 1.1.1.1
- network 10.0.0.0 0.255.255.255 area 3
- network 20.0.0.0 0.255.255.255 area 1

Router 1

router ospf 1
router-id 2.2.2.2
network 20.0.0.0 0.255.255.255 area 1
network 30.0.0.0 0.255.255.255 area 0

Router 2

router ospf 1
router-id 3.3.3.3
network 20.0.0.0 0.255.255.255 area 0
network 40.0.0.0 0.255.255.255 area 2

In Router 0
Interface loopback 0
ip add 172.16.1.252 255.255.0.0
no shutdown

In Router 1
Interface loopback 0
ip add 172.16.1.254 255.255.0.0
no shutdown

MY PAGES
Date __/__/__

In Router 2

Interface loopback 0
ip add 172.16.1.254 255.255.0.0
no shutdown

Observation

C - connected, S - Static, R - RIP, M - Mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
r - candidate default
p - periodic downloaded static route

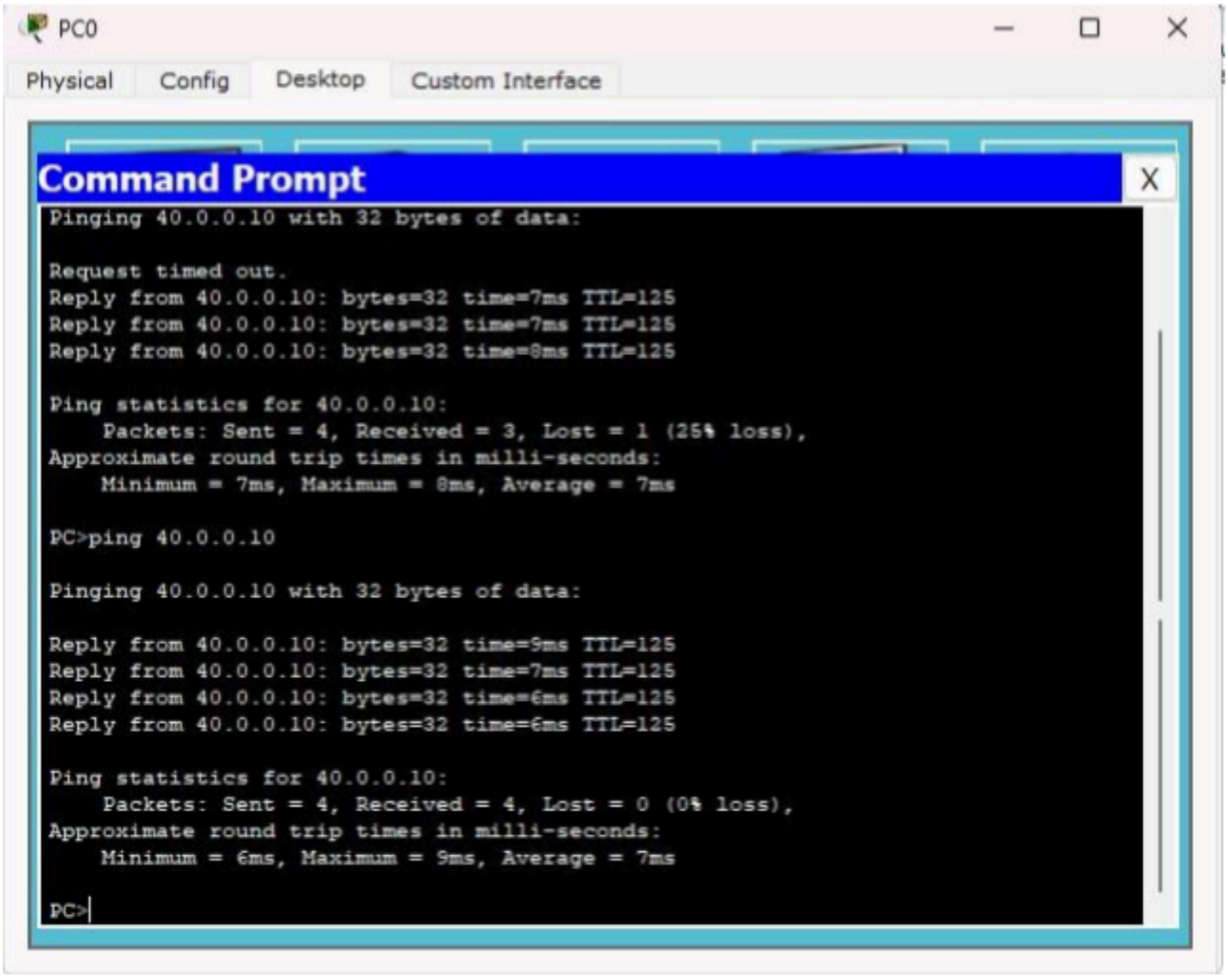
Ping 40.0.0.1

Reply from 40.0.0.1 bytes=32 time 0ms TTL=254

Sent - 4 Received=4, Lost=0 (0% loss.

this is the result

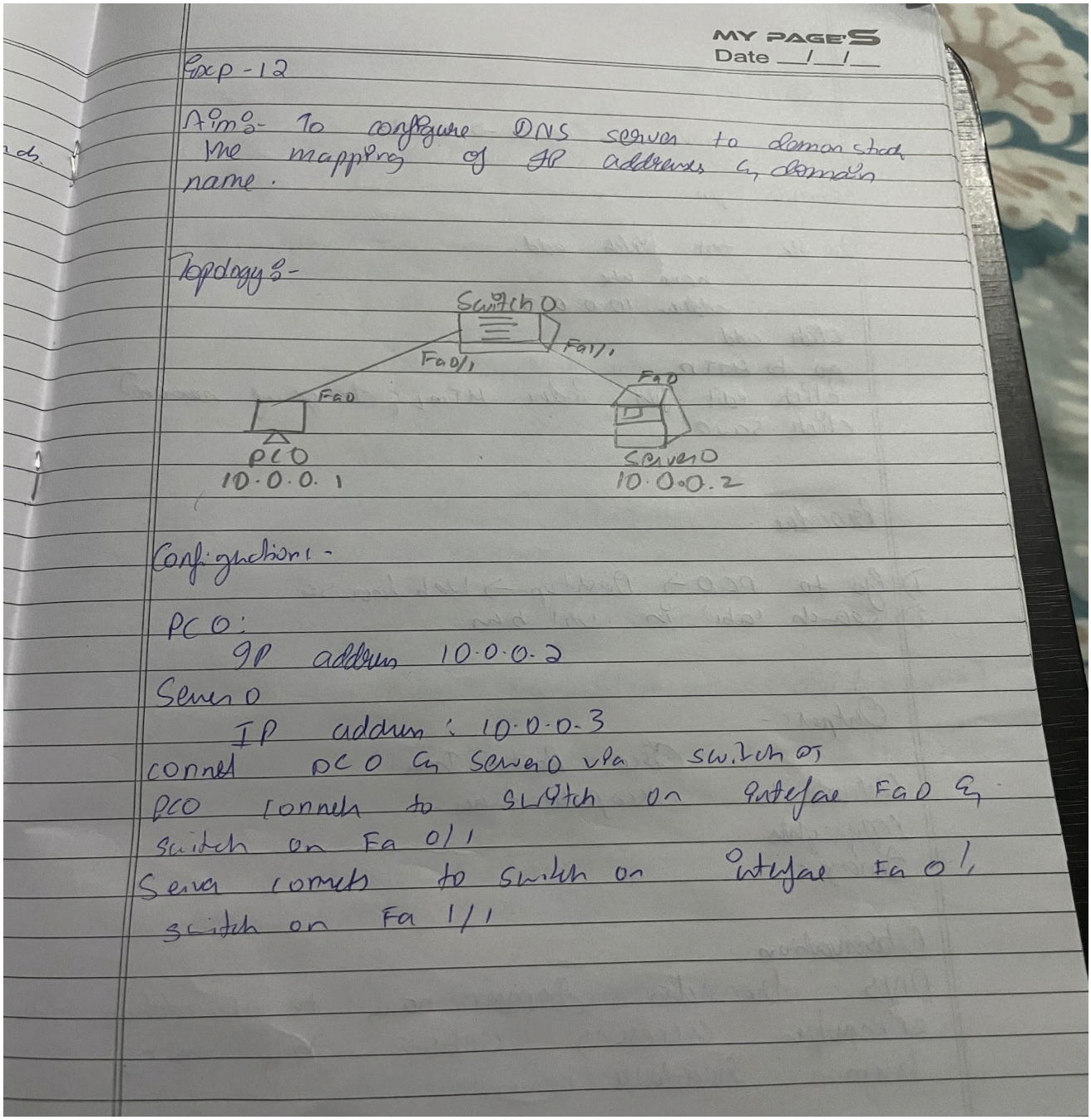
Screen Shots:



Program 9

Aim: Configure Web Server, DNS within a LAN.

Topology , Procedure and Observation:



Server 0

Go to Server → Service → DNS

Enable on

In the text fields add.
name: abc
address: 10.0.0.3
click add
go to HTTP
click edit for index.HTML {change if needed}
click save

Procedure:

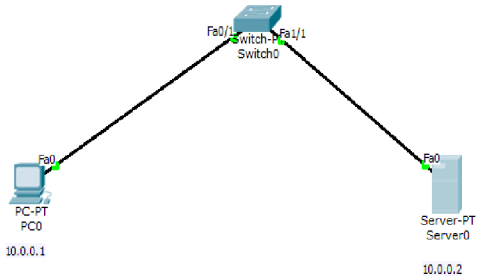
1) Go to PC0 → Desktop → Web browser
2) Search 'abc' in url bar

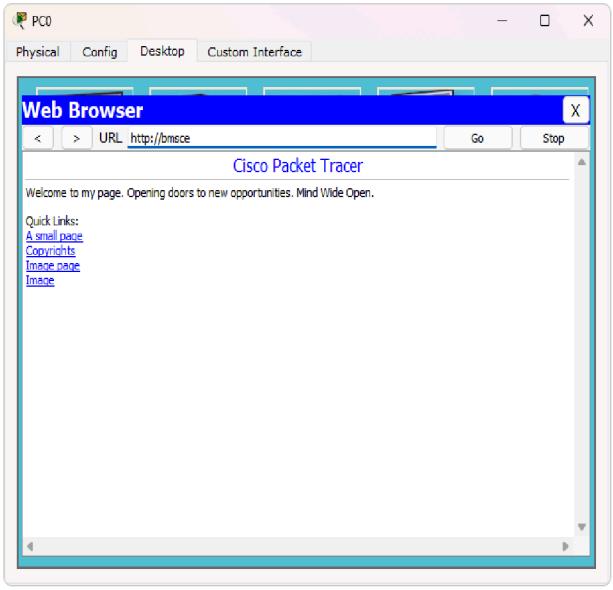
Output:-

Cisco Packet Tracer.
Welcome to ciscopacket tracer.
Copyright
Image.

Observation
DNS translates domain name to IP address it simplifies accessing website by using human readable names.

Screen Shots:

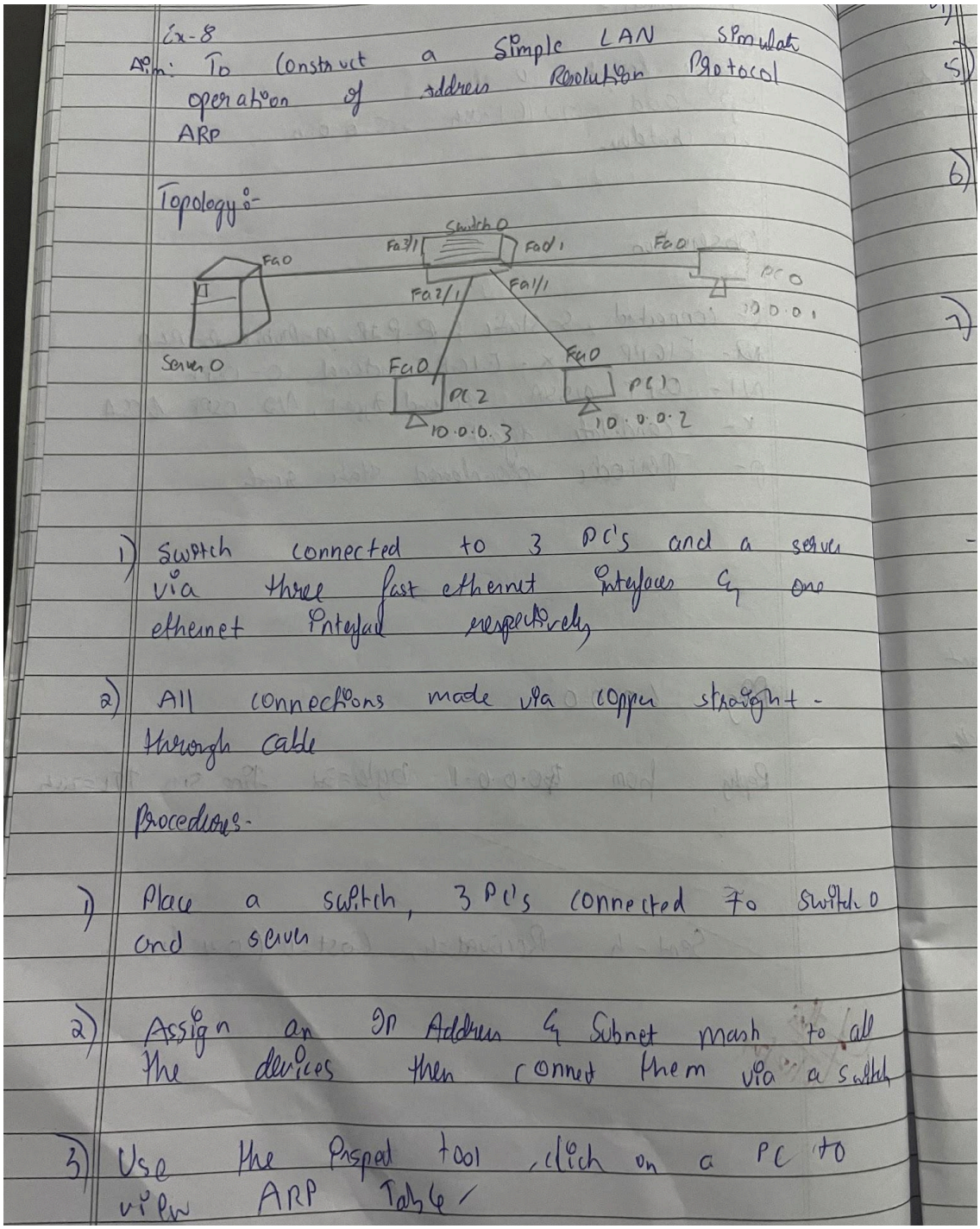




Program 10

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

Topology , Procedure and Observation:



MY PAGES
Date __/__/__

4) Display ARP Table

5) In CLI of switch
- show mac address

6) Use captive button in the simulation panel to go step by step so that there are changes in ARP

7) Observe switch as well as node update in the ARP Table

Observation.

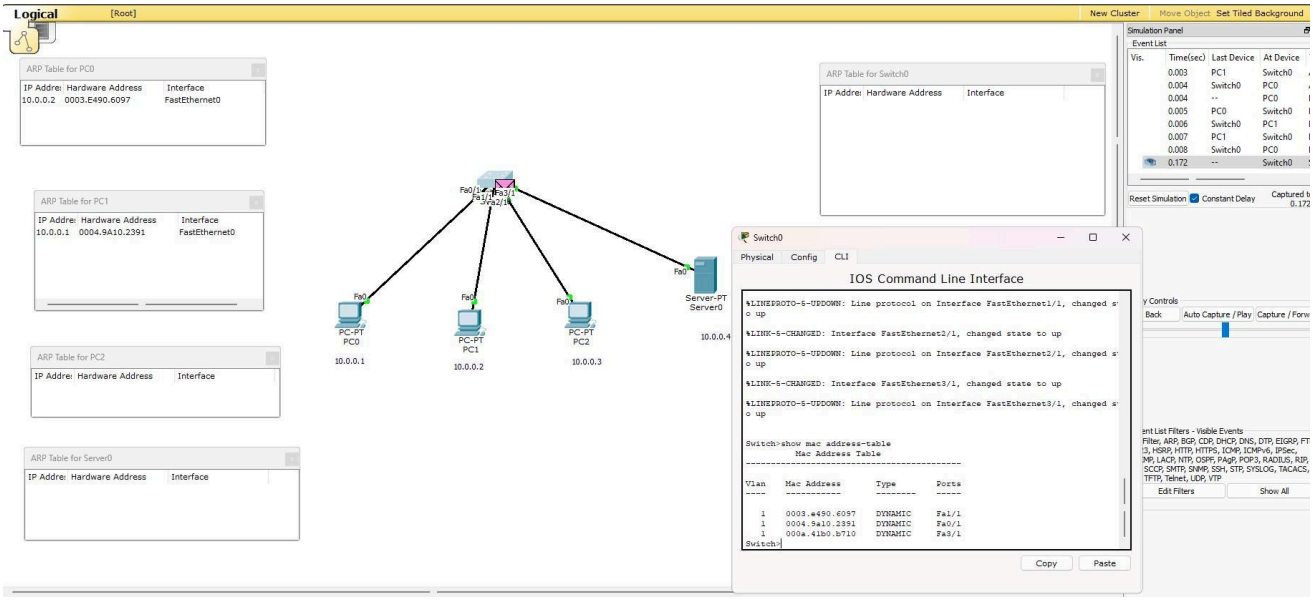
- As the message travels from one source host to its destination host the ARP table of all device gets updated

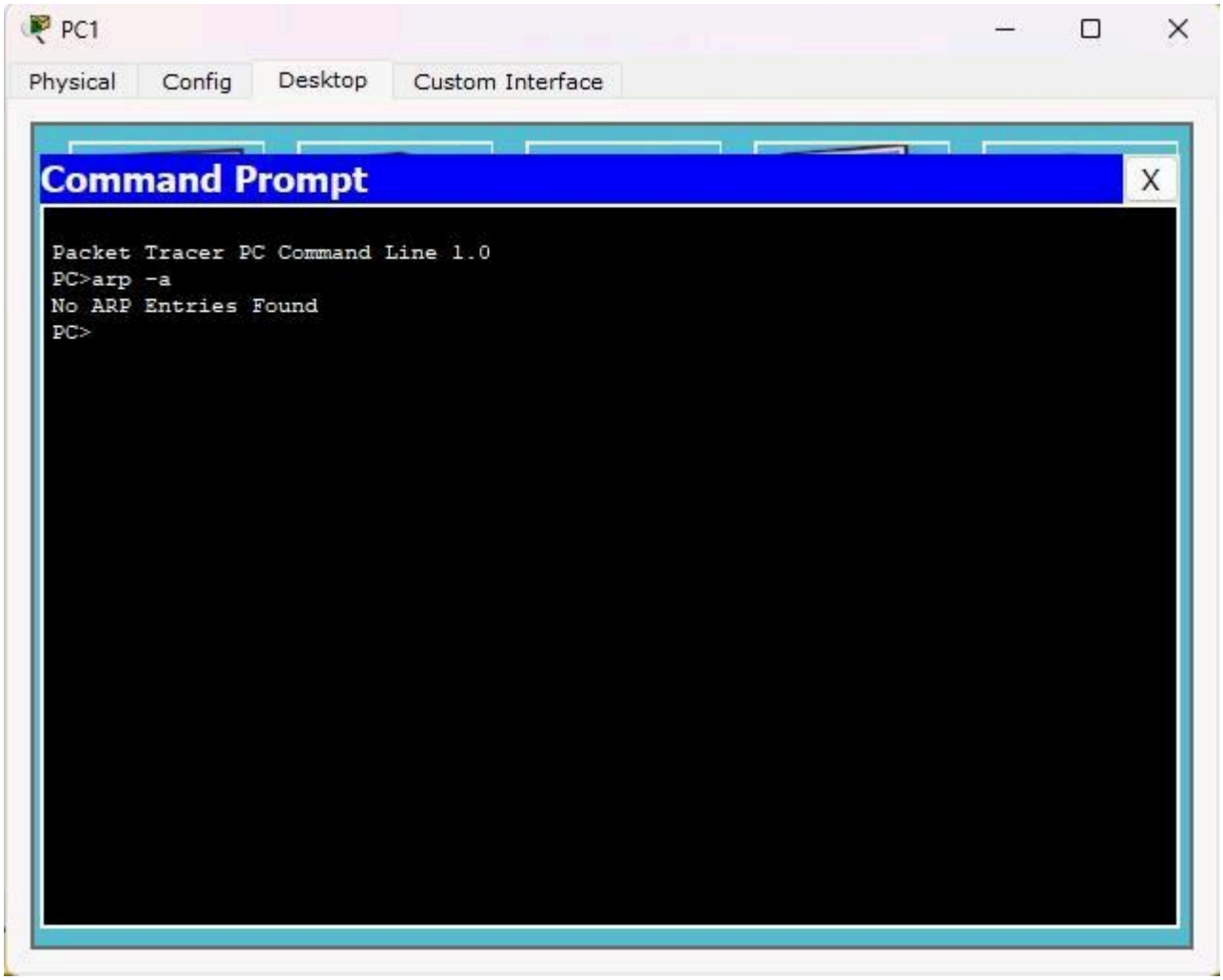
ARP maps an IP address to a MAC address to ensure communication within a local network

ARP Table for PC 0

IP	Hardware Address	Interface
10.0.0.3	0060.2F29.2CB8	FastEthernet0

Screen Shots:

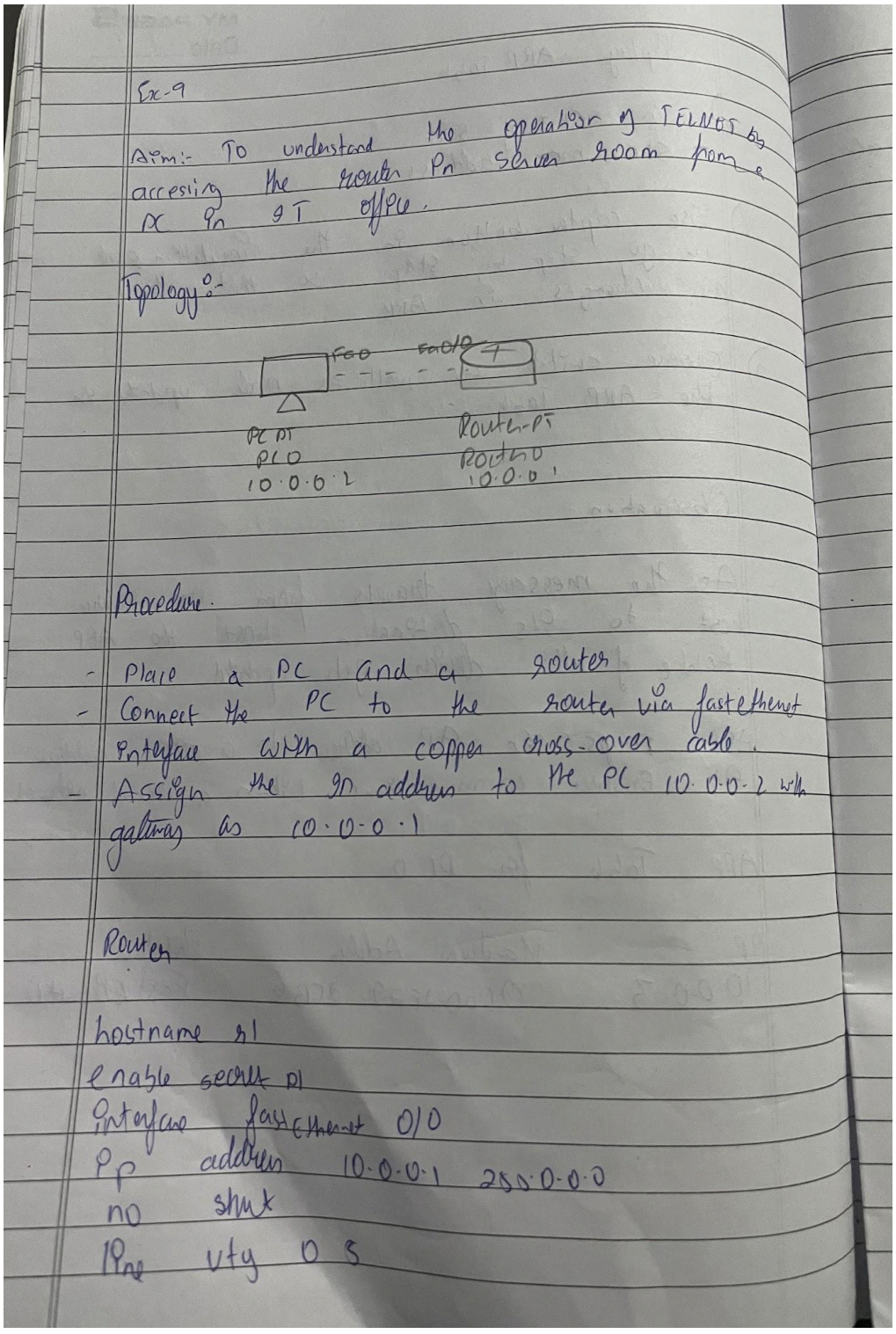



PC1
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>arp -a
No ARP Entries Found
PC>

Program 11

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

Topology , Procedure and Observation:



MY PAGES
Date __/__/__

login
password p0
exit

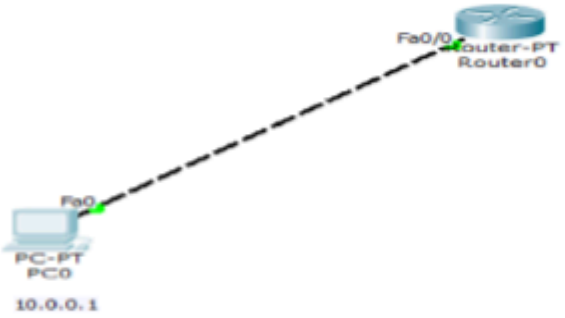
In command mompt

Password for user authentication is p0
Password for enable is p1

Observations

- TELNET is a protocol for remote access
- It allows command-line communication a network
- The PC is able to send the data to router and indicates that the gateway is available and connected

Screen Shots:



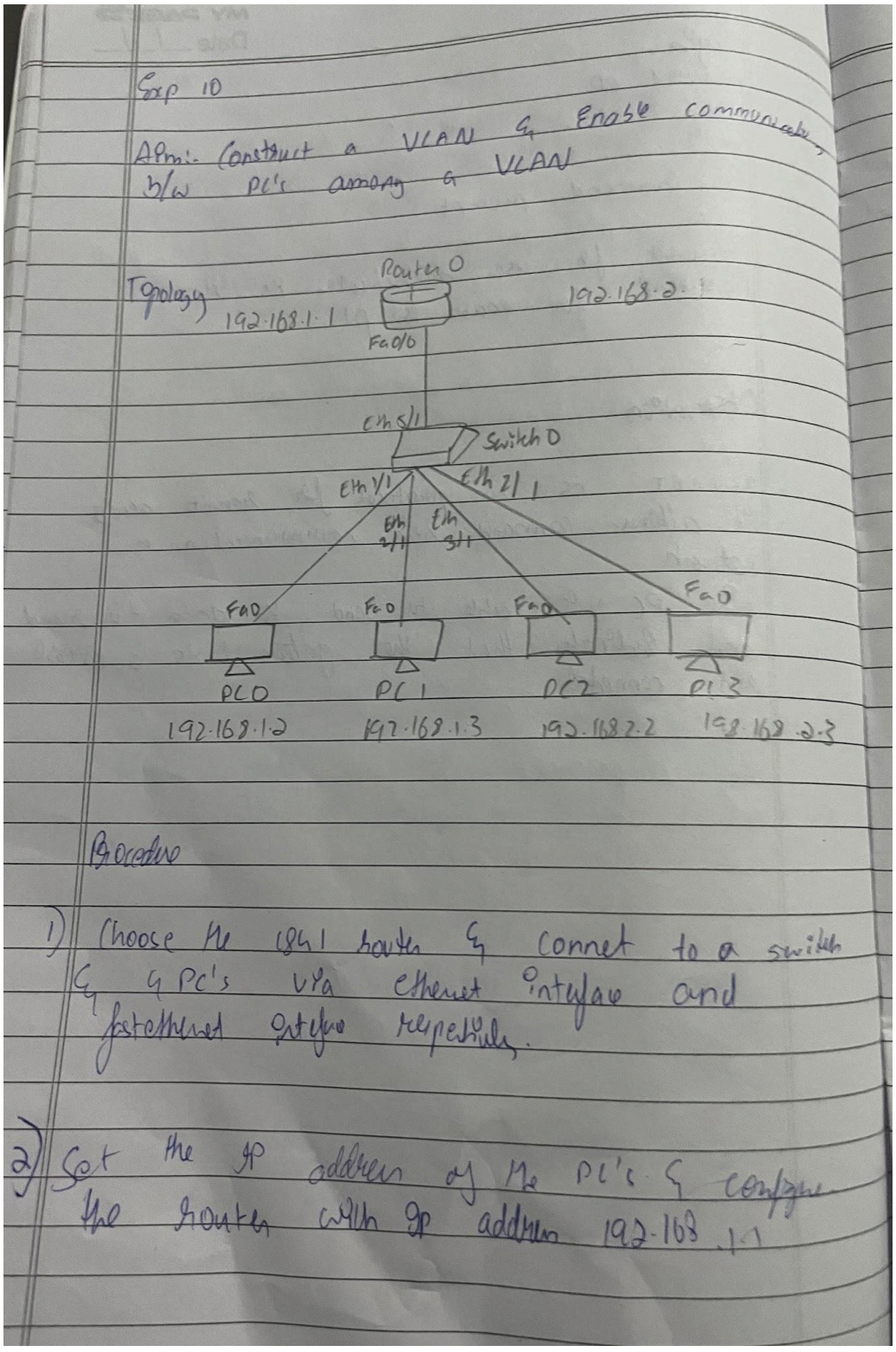
Command Prompt

```
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:
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#
```

Program 12

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

Topology , Procedure and Observation:



Date __/__/__

enable.
terminal
interface Fa 0/0
ip address 192.168.1.1 255.255.255.0
no shut

3) In the switch, go to config tabs & select VLAN Database

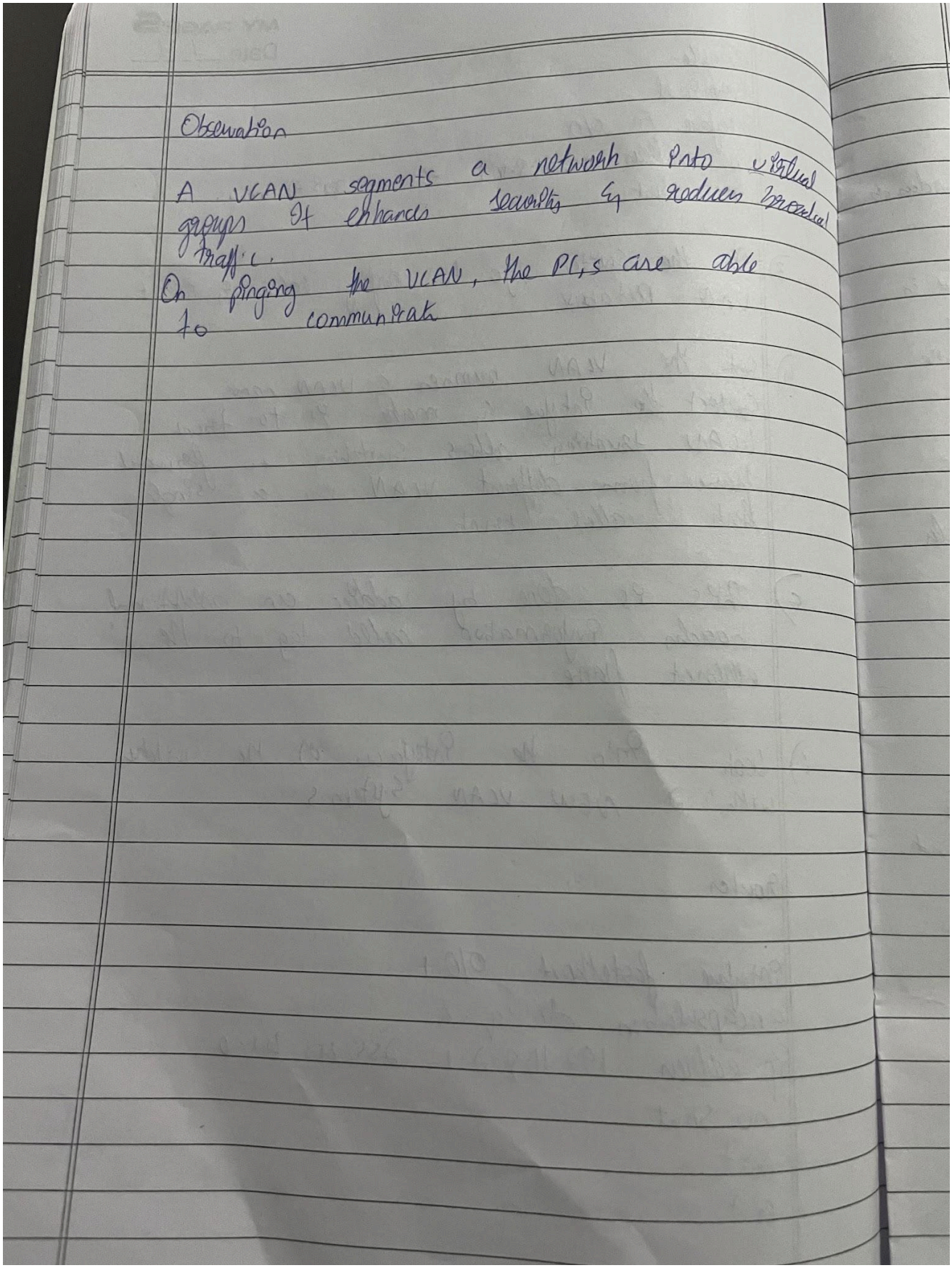
4) Set the VLAN number & VLAN name
Select the interface & make it to trunk.
VLAN trunking allows switching to forward frame from different VLAN on a single link called trunk

5) This is done by adding an additional header information called tag to the ethernet frame

6) Look into the interfaces of the switches with 2 NEW VLAN systems.

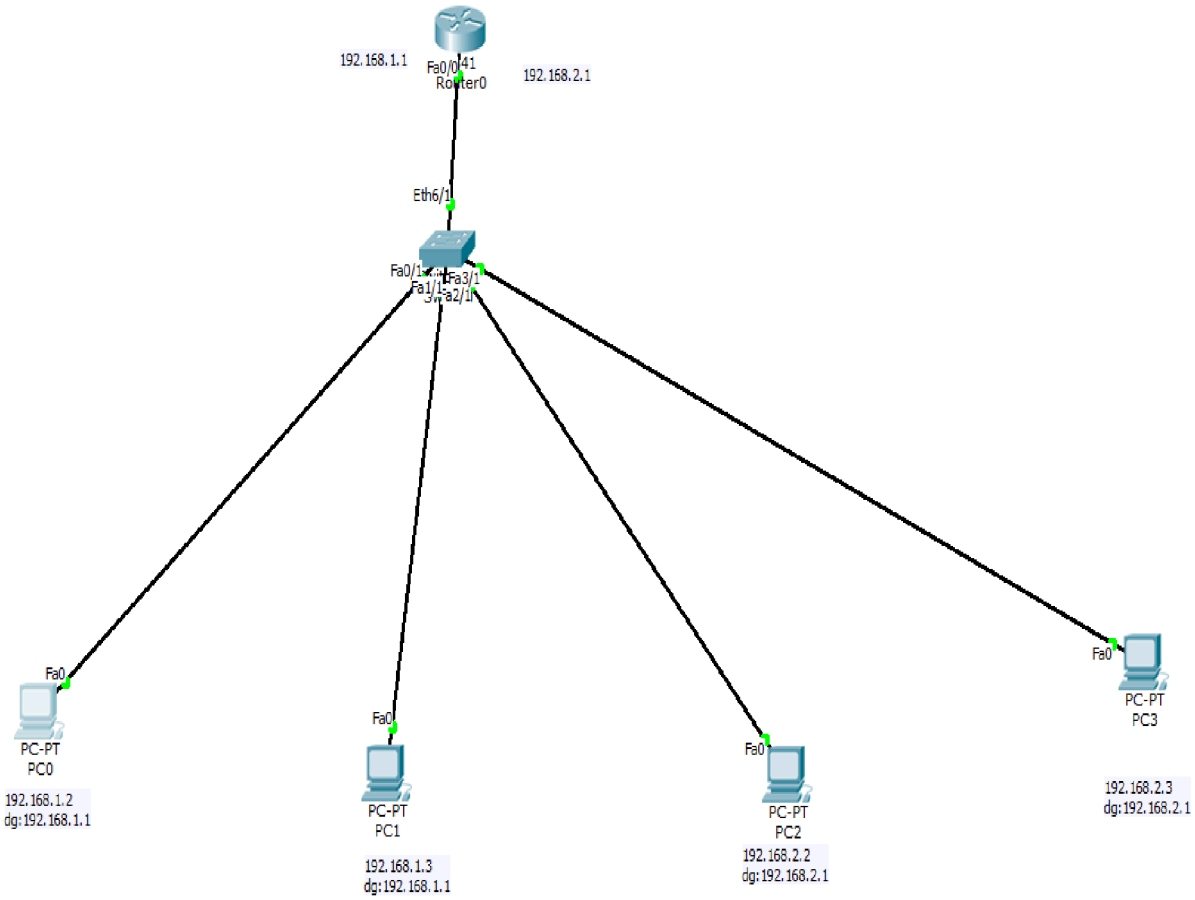
Router

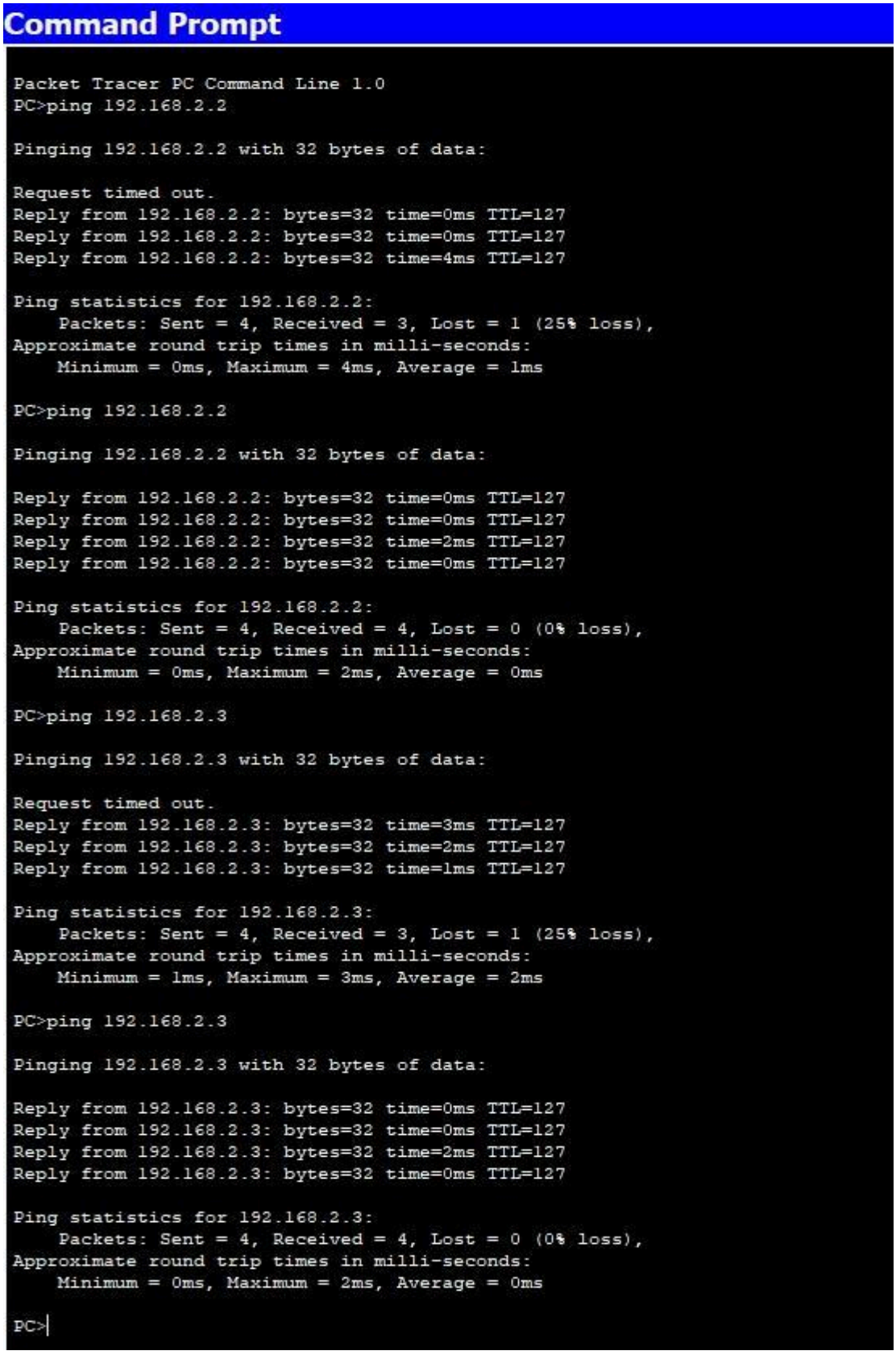
interface fastethernet 0/0.1
encapsulation dot1q 2
ip address 192.168.2.1 255.255.255.0
no shut
exit
exit


Observation

A VLAN segments a network into virtual groups of hands to reduces unwanted traffic.
On pinging the VLAN, the PC,s are able to communicate

Screen Shots:

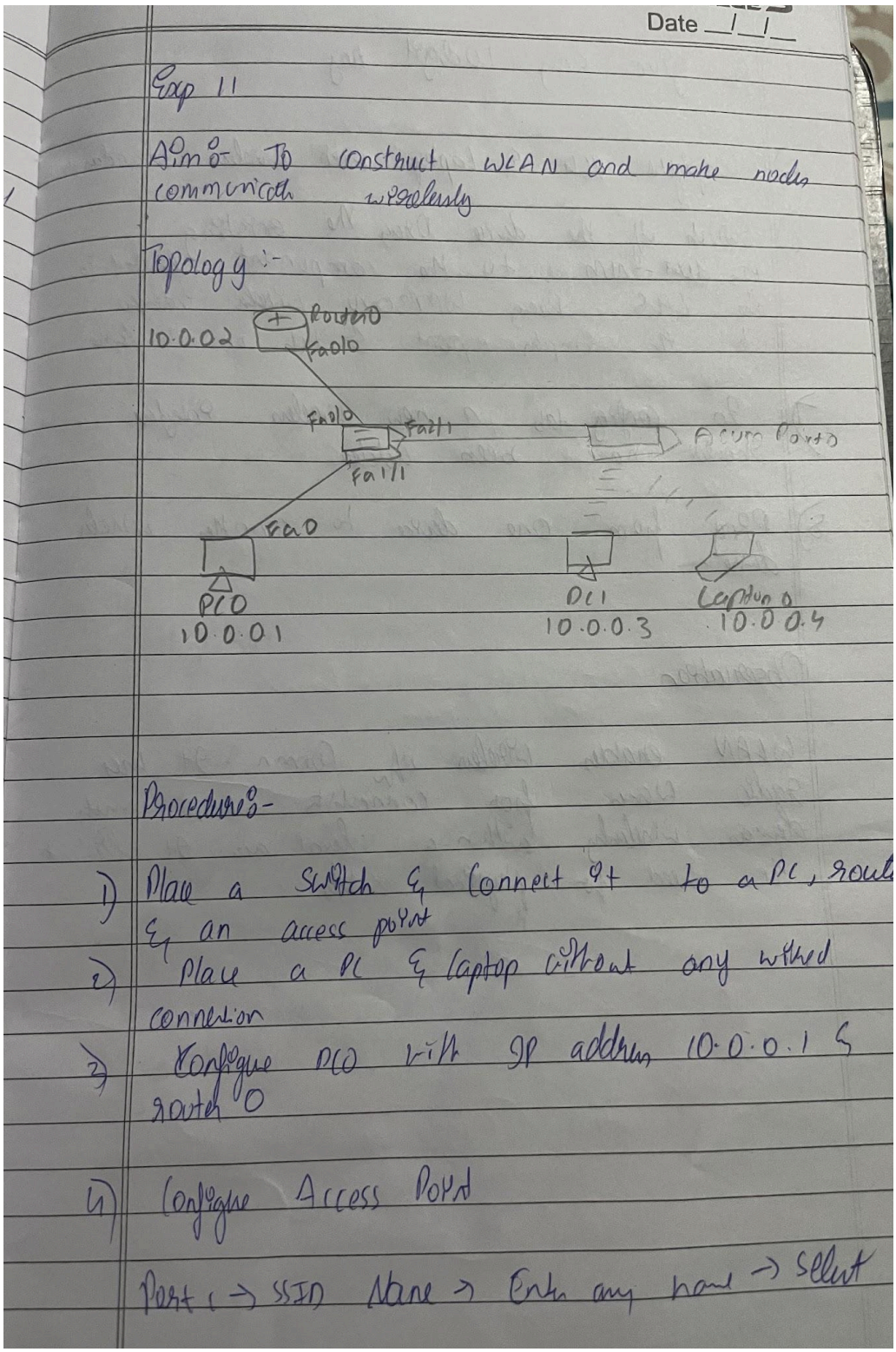



Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.2
Pinging 192.168.2.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=4ms TTL=127
Ping statistics for 192.168.2.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 4ms, Average = 1ms
PC>ping 192.168.2.2
Pinging 192.168.2.2 with 32 bytes of data:
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=2ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Ping statistics for 192.168.2.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 2ms, Average = 0ms
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.3: bytes=32 time=3ms TTL=127
Reply from 192.168.2.3: bytes=32 time=2ms TTL=127
Reply from 192.168.2.3: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 3ms, Average = 2ms
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Reply from 192.168.2.3: bytes=32 time=2ms TTL=127
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 2ms, Average = 0ms
PC>

Program 13

Aim: To construct a WLAN and make the nodes communicate wirelessly.

Topology , Procedure and Observation:



& give any 10 digit key

5) Configure PC & Laptop with wireless standard

6) Switch off the device. Drag the existing PT-HOST-NM to the component listed in the LHS Drag WMP300N wireless interface to the Empty port Switch on the device

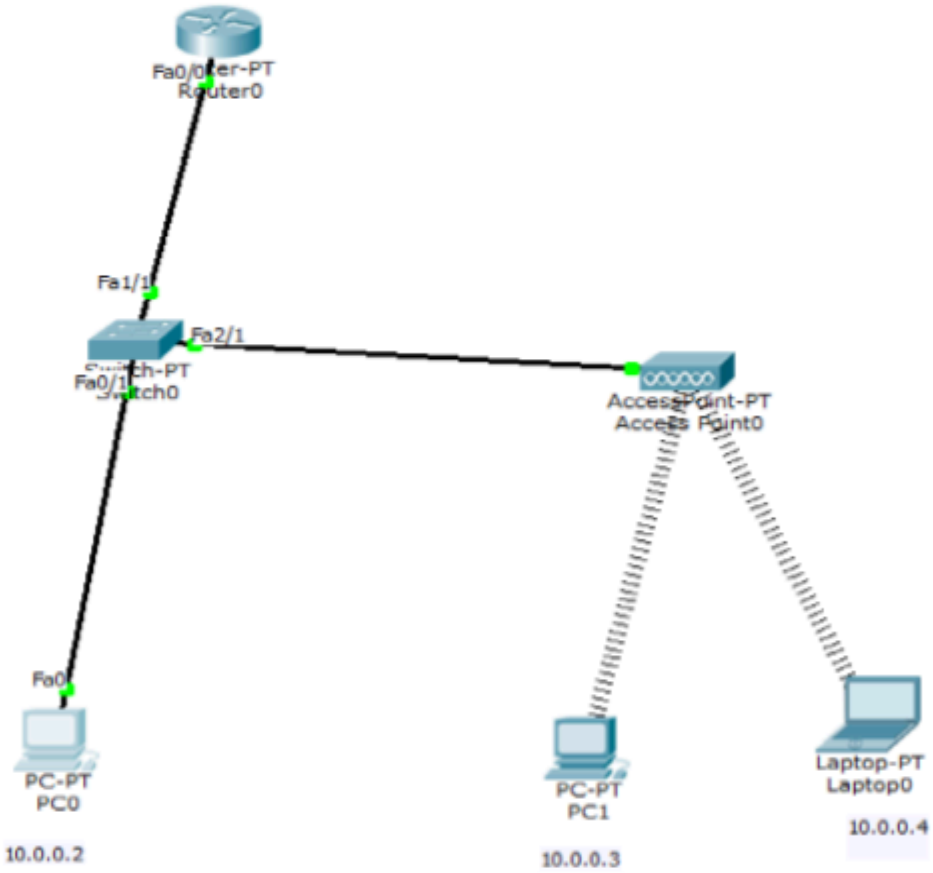
7) In config tab, a new wireless interface should have been added

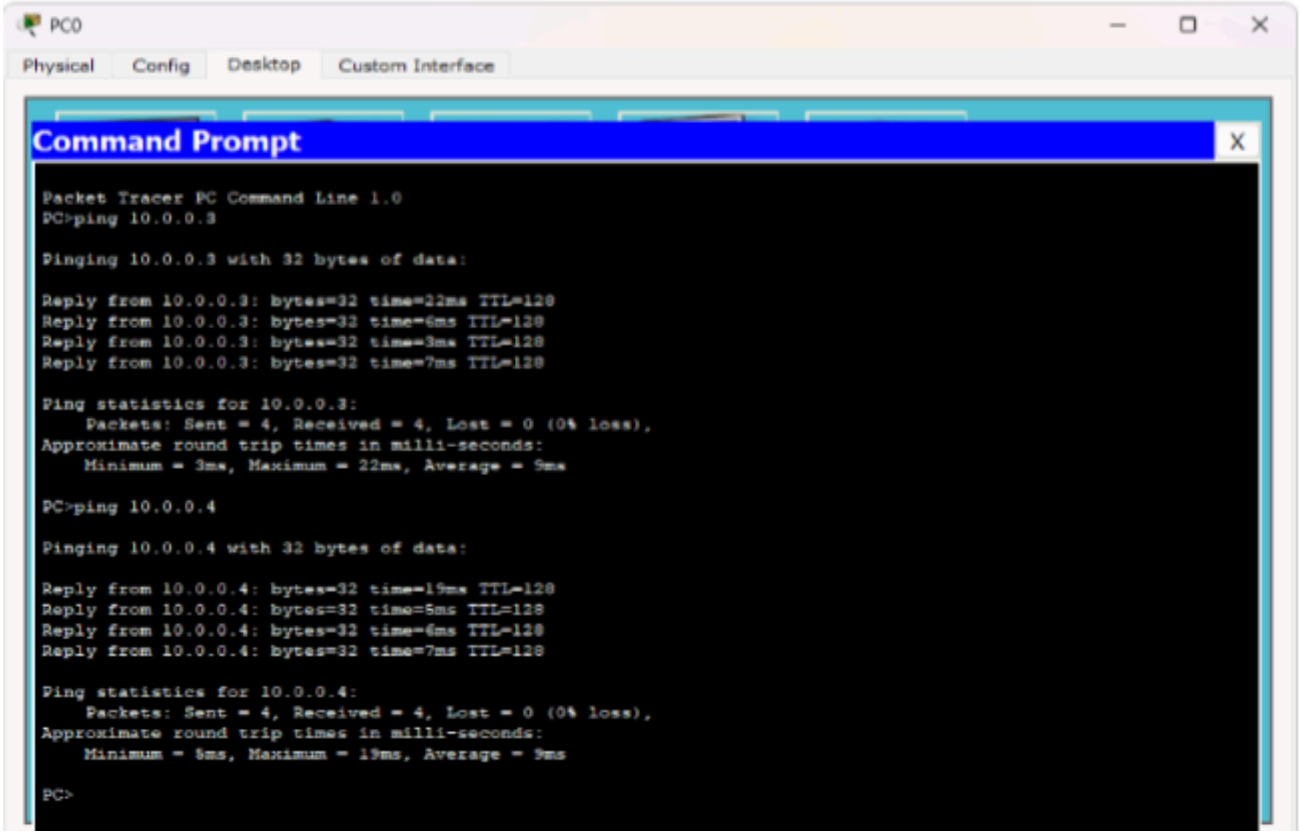
8) Ping from one device to another wireless device.

Observation

WLAN enables wireless n/w Comm. It uses radio waves for connectivity. WLAN connects devices wirelessly within a local area. It eliminates the need for physical cables

Screen Shots:



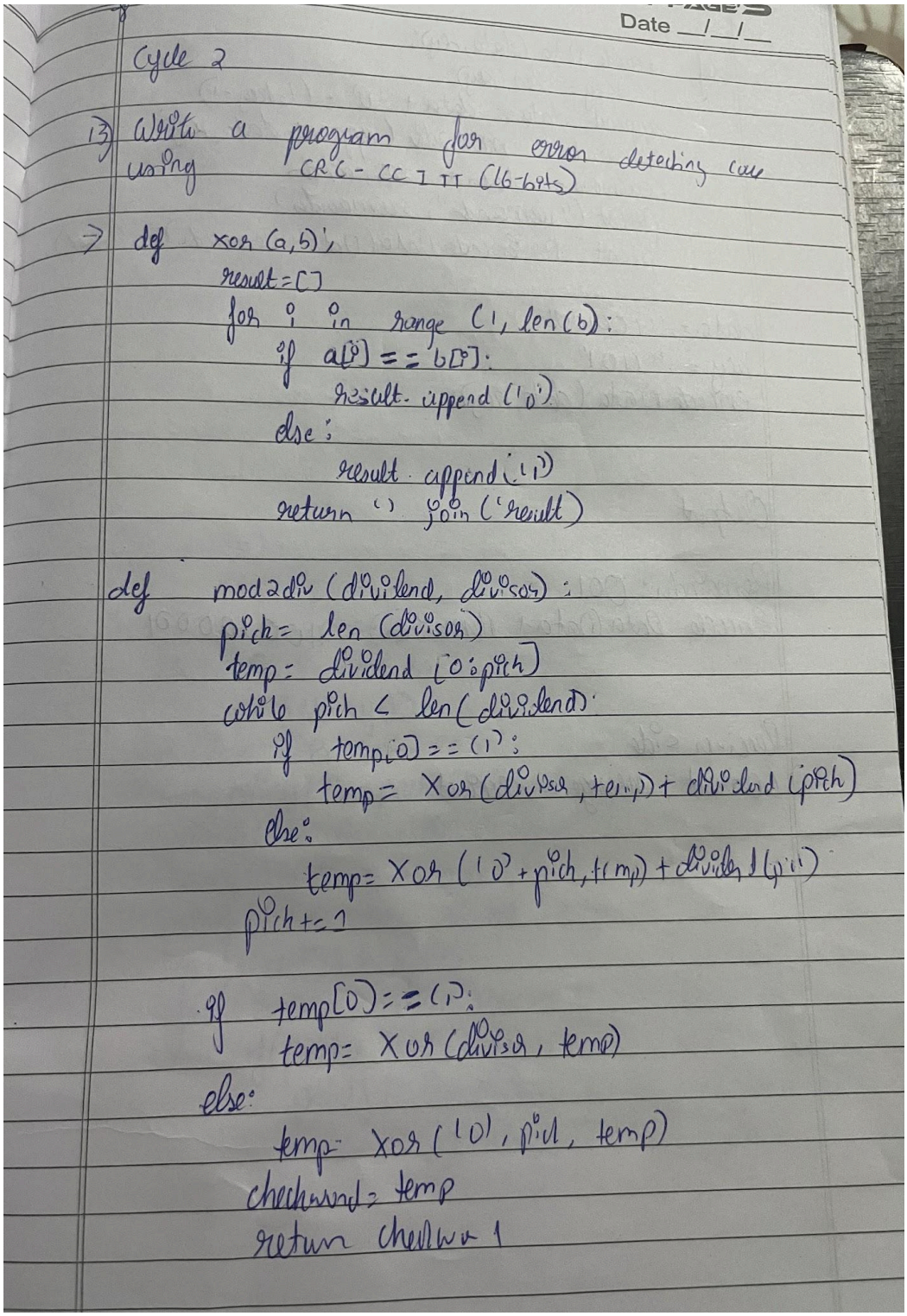


PART-B

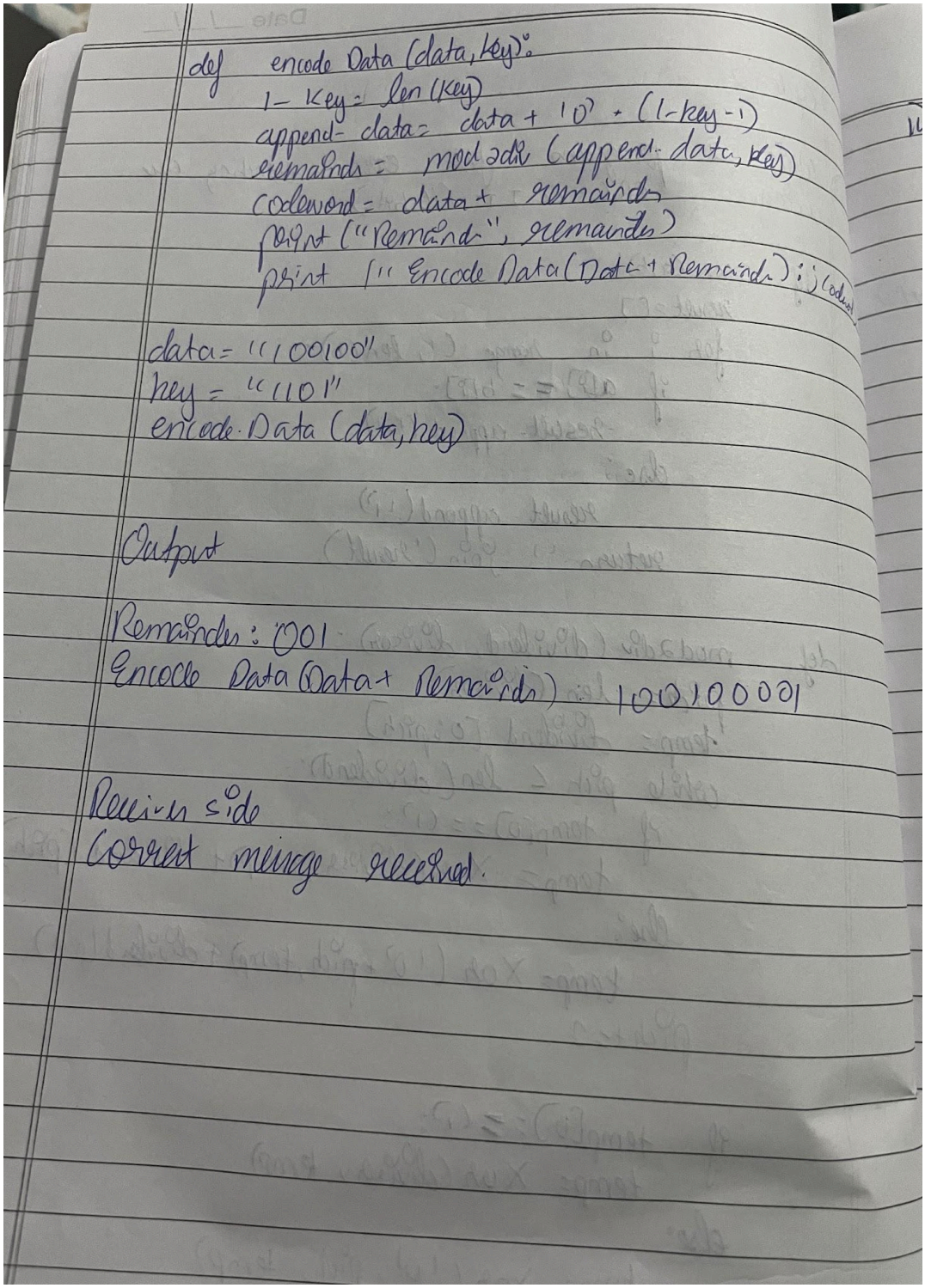
Program 14

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

Code and Output:



```
Cycle 2

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

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

    if temp[0]=='1':
        temp= xor(divisor, temp)
    else:
        temp= xor('0'*pick, temp)
    checkword= temp
    return checkword
```



```
def encodeData(data, key):
    l_key = len(key)
    append_data = data + '0' * (l_key - 1)
    remainder = mod2div(append_data, key)
    codeword = data + remainder
    print("Remainder", remainder)
    print("Encode Data (Data + Remainder):", codeword)

data = "100100"
key = "1101"
encodeData(data, key)
```

Output

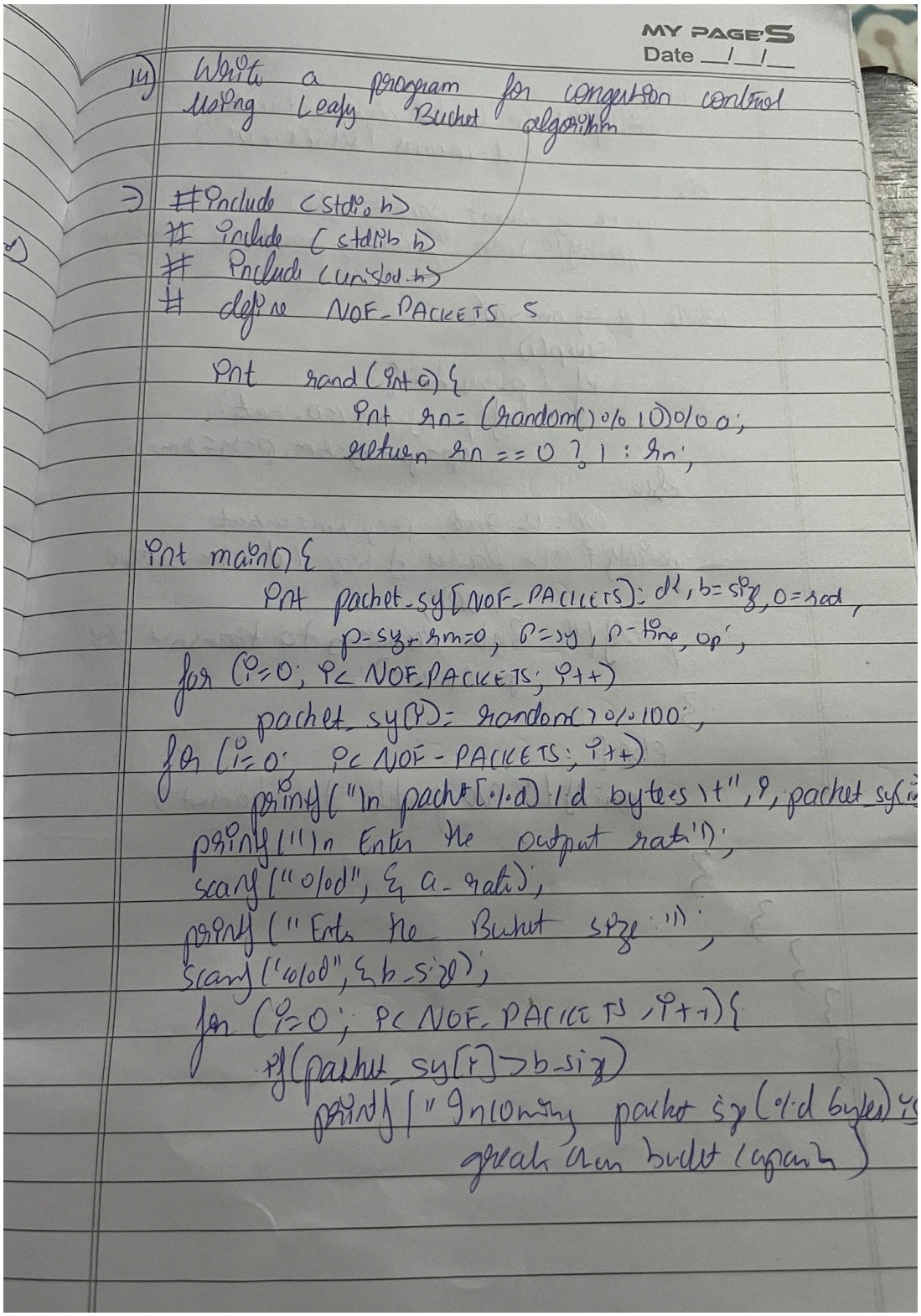
Remainder : 001
Encode Data (Data + Remainder) : 100100001

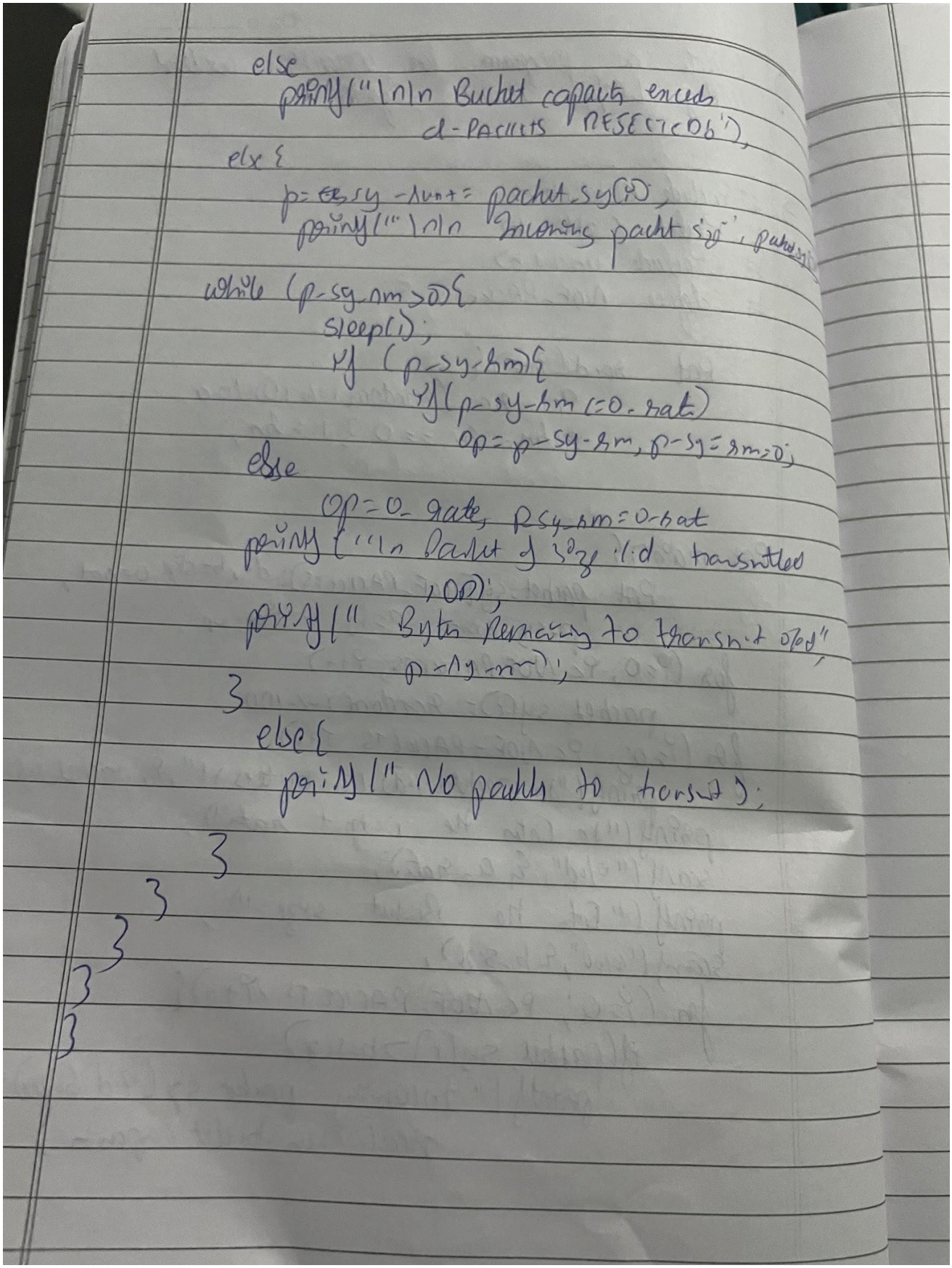
Receiver side
Correct message received.

Program 15

Write a program for congestion control using Leaky bucket algorithm.

Code and Output:





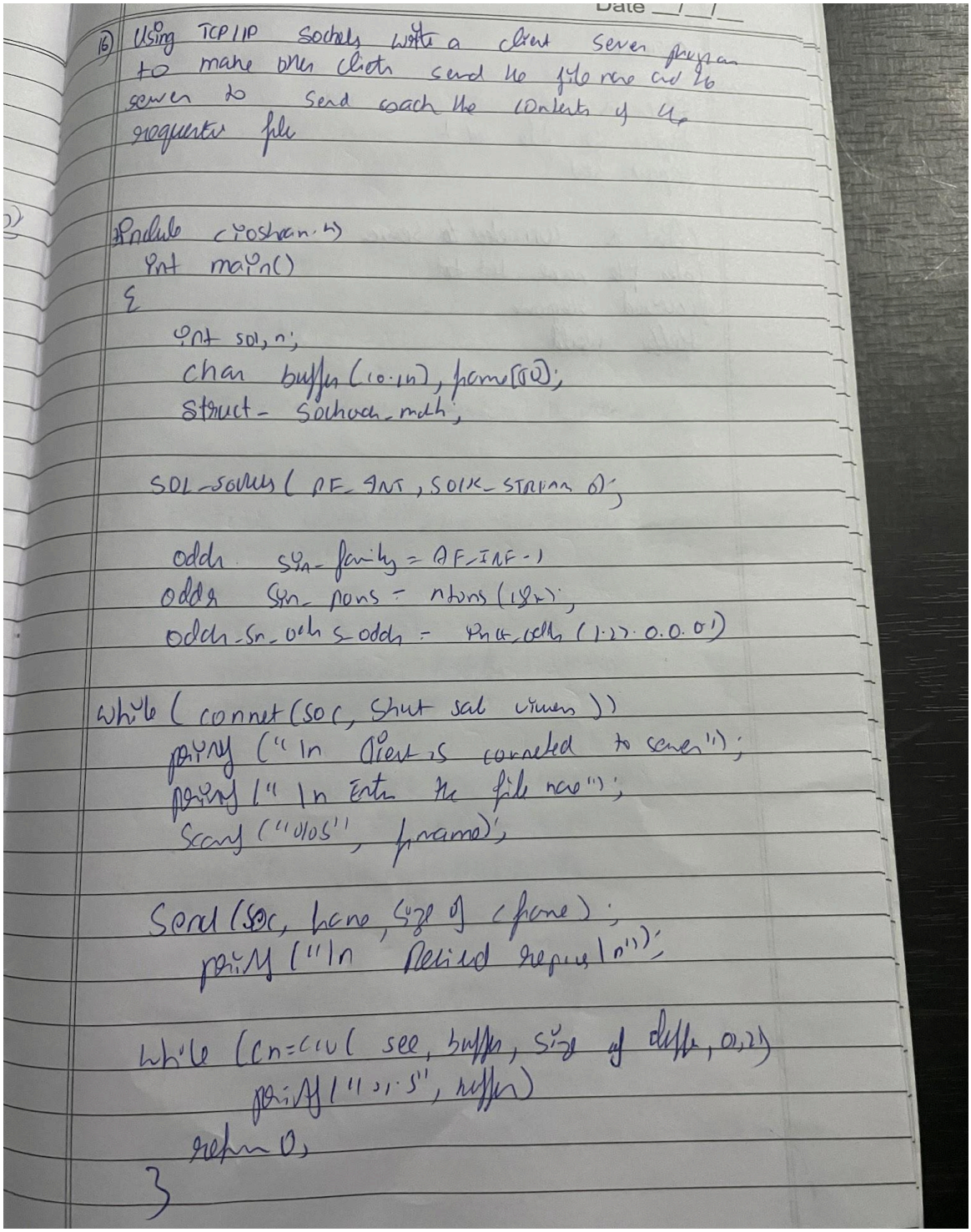
```
else
    printf("\n\n Bucket capacity exceeds
            d-PACKETS RESETTING\n");
else {
    p->sy_count += packet_sz[i];
    printf("\n\n Incoming packet size", packet_sz[i]);

while (p->sy_count > 0){
    sleep(i);
    if (p->sy_count){
        if(p->sy_count <= o_rate)
            op = p->sy_count, p->sy_count = 0;
    else
        op = o_rate, p->sy_count = o_rate
    printf("\n Packet of size %d transmitted
            ", op);
    printf(" Bytes remaining to transmit %d",
            p->sy_count);
}
else{
    printf(" No packets to transmit");
}
}
}
}
}
```

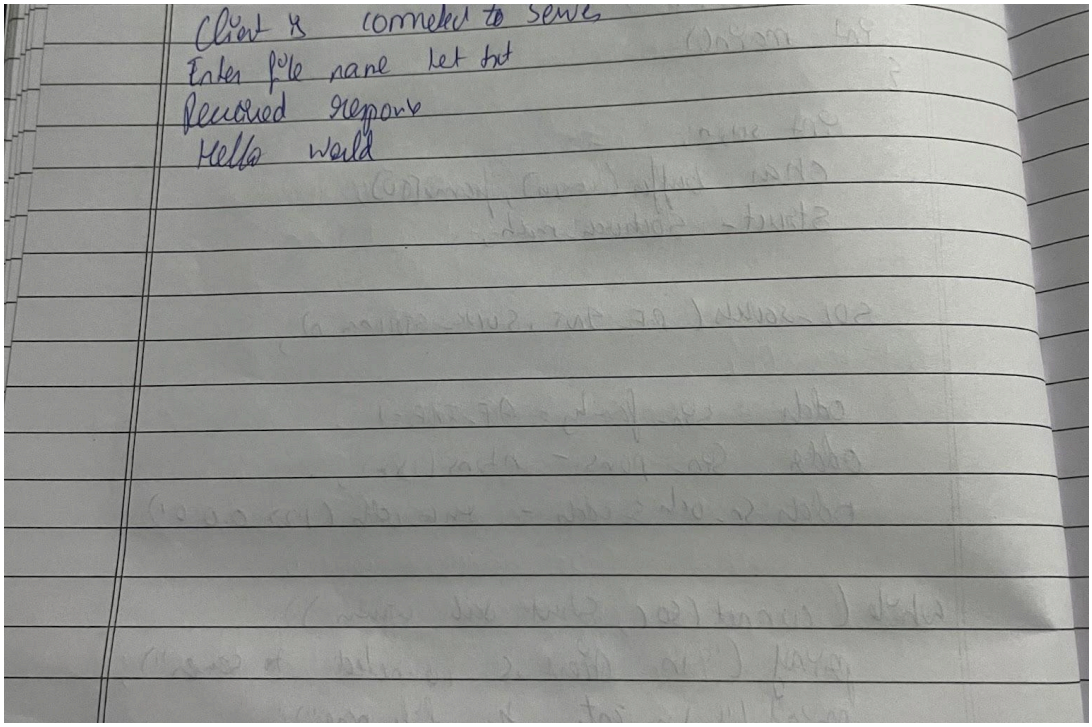
,

Program 16

Using TCP/IP sockets, write a client-server program to make the client send the file name and the server to send back the contents of the requested file if present.

Code and Output:

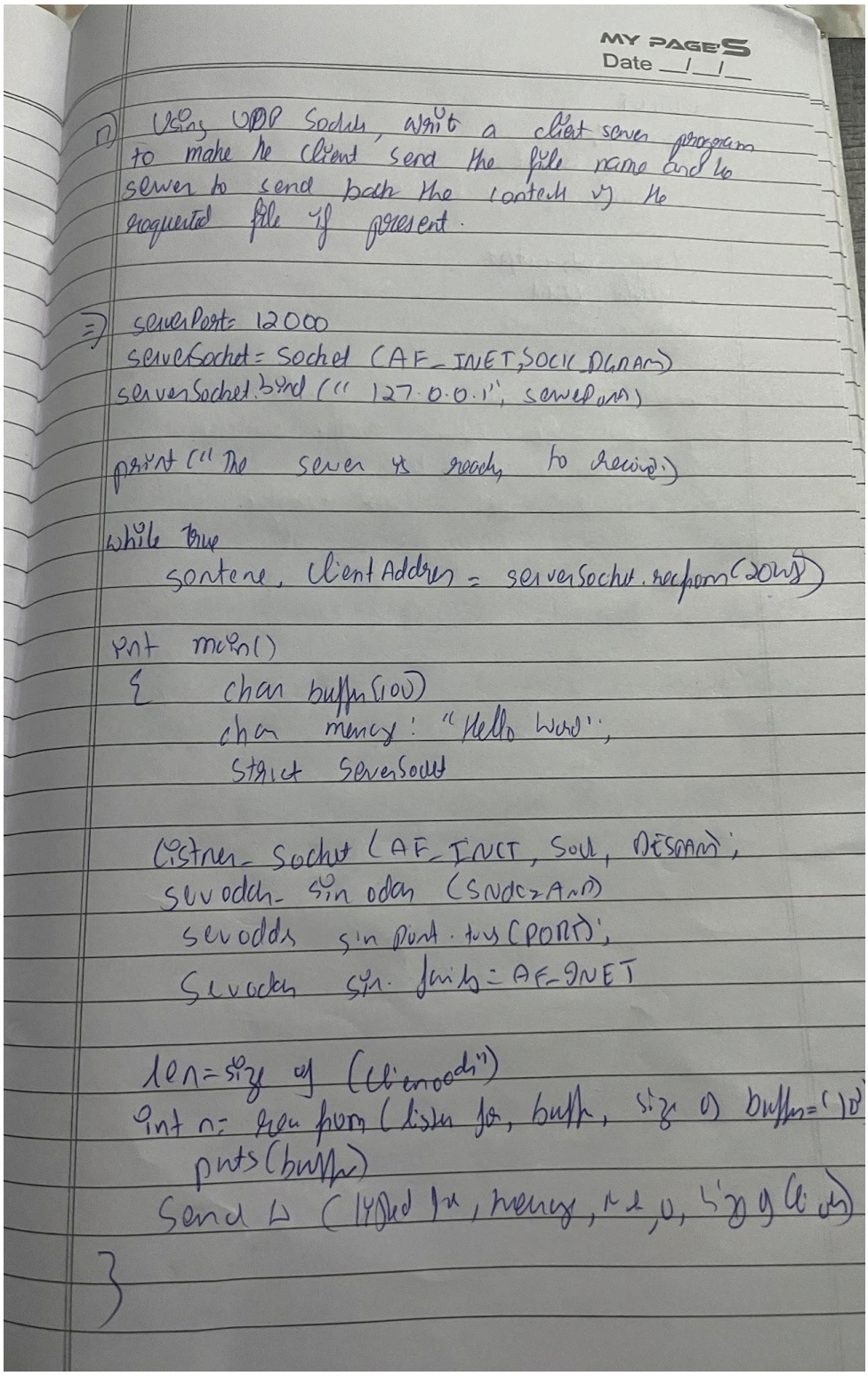


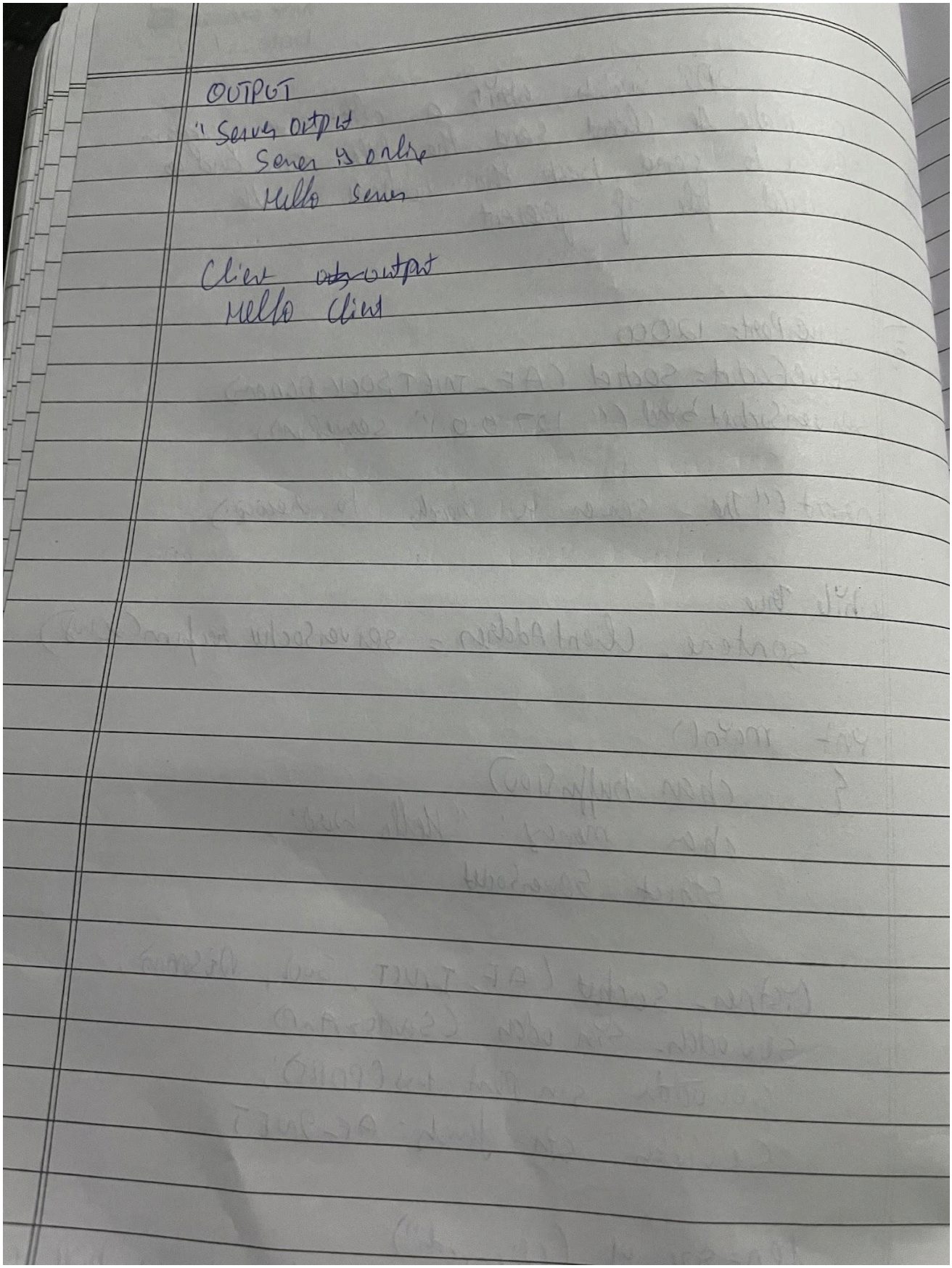

Client is connected to server
Enter file name test.txt
Received response
Hello World

Program 17

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

Code and Output:




OUTPUT

i Server output

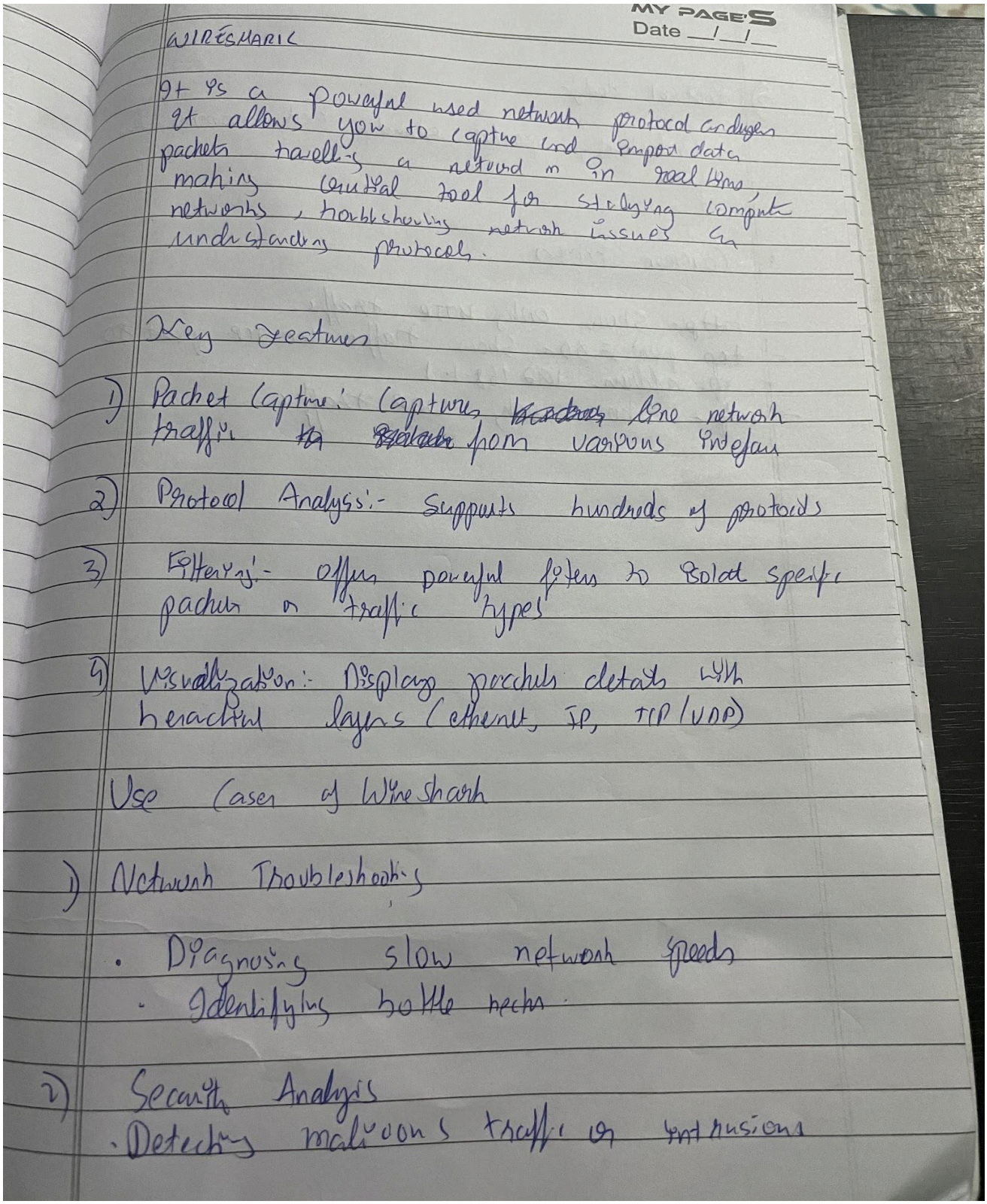
Server is online

Hello Server

Client output

Hello Client

18. WIRESHARK



WIRESHARK

It is a powerful used network protocol analyzer. It allows you to capture and interact data packets travelling in a network in real time, making crucial tool for studying computer networks, troubleshooting network issues & understanding protocols.

Key features

1) Packet Capture: Captures live network traffic from various interfaces.
2) Protocol Analysis:- Supports hundreds of protocols
3) Filtering:- offers powerful filters to isolate specific packets or traffic types
4) Visualization: Displays packets details with hierarchical layers (ethernet, IP, TCP/UDP)

Use Cases of Wireshark

1) Network Troubleshooting
   - Diagnosing slow network speeds
   - Identifying bottlenecks
2) Security Analysis
   - Detecting malicious traffic or intrusions

3) Protocol Study:

- Understanding packet structure and communication flow

1. Common Filters

- http - Show only HTTP traffic
- tcp port == 80 - Show traffic on TCP port 80
- ip.addr == 192.168.1.1
- udp - Show only UDP traffic.