VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB RECORD

Computer Network Lab (23CS5PCCON)

Submitted by

Samraat Dabolay (1BM22CS236)

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
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 **Samraat Dabolay (1BM22CS236),** 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.

Ramya K M	Dr. Kavitha Sooda
Assistant Professor	Professor & HOD
Department of CSE, BMSCE	Department of CSE, BMSCE

Index

Sl. No.	Date	Experiment Title	Page No.
1	04/10/2024	Create a topology involving multiple hubs and a switch connecting them to simulate with simple PDU.	1
2	18/10/2024	Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply	5
3	25/10/2024	Configure default route, static route to the router	10
4	08/11/2024	Configure DHCP within a LAN and outside LAN.	17
5	22/11/2024	Configure RIP routing Protocol in Routers	22
6	22/11/2024	Configure OSPF routing protocol	28
7	22/11/2024	Demonstrate the TTL/ Life of a Packet	37
8	08/11/2024	Configure Web Server, DNS within a LAN.	42
9	20/12/2024	To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)	47

10	20/12/2024	To understand the operation of TELNET by accessing the router in server room from a PC in IT office.	51
11	20/12/2024	To construct a VLAN and make the PC’s communicate among a VLAN	54

Index-Cycle-II

Sl. No.	**Date**	**Experiment Title**	**Page No.**
1	15/11/2024	Write a program for error detecting code using CRC-CCITT (16-bits).	64
2	15/11/2024	Write a program for congestion control using Leaky bucket algorithm	69
3	20/12/2024	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.	73
4	20/12/2024	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.	78

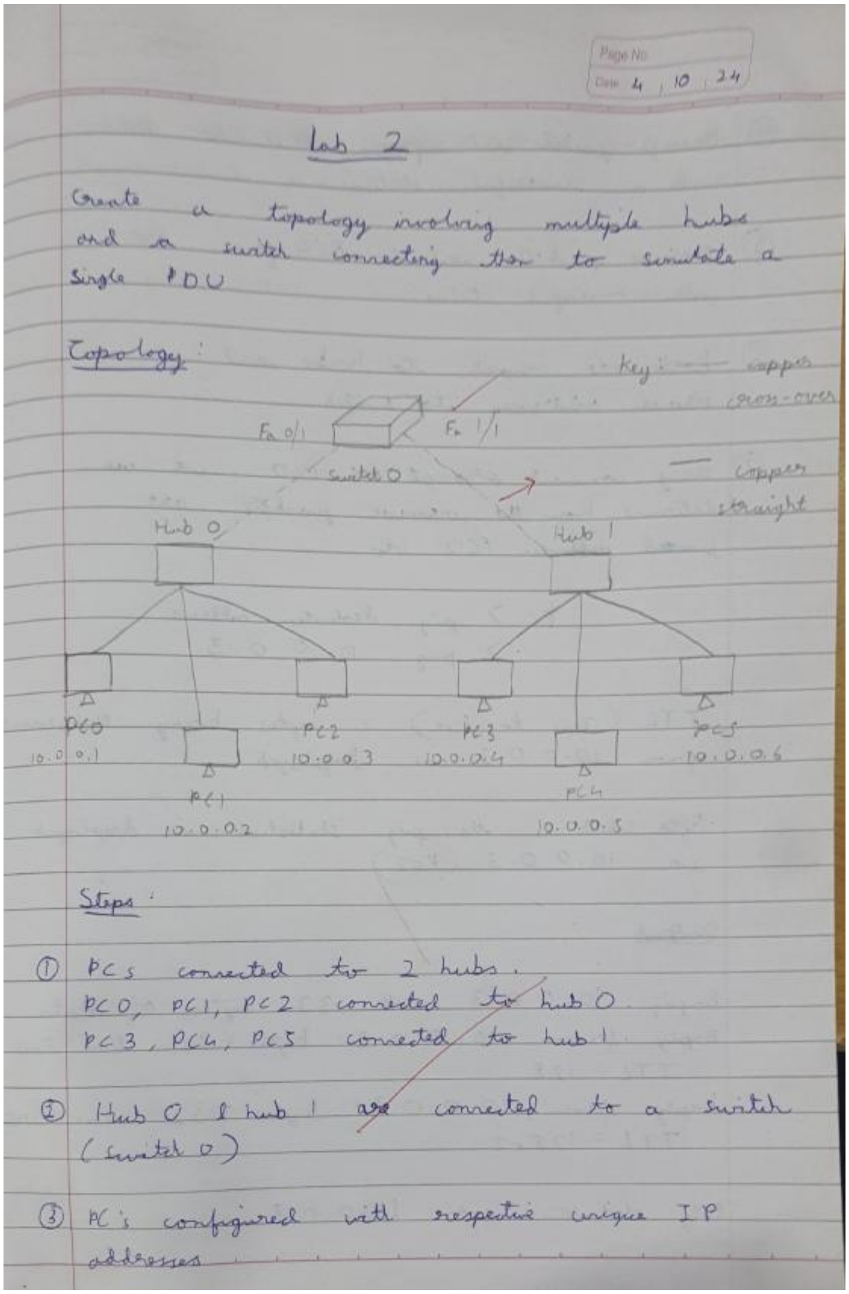
Github Link:
https://github.com/samraatd/CN-LAB

Program 1

i. Aim of the program

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

ii. Procedure along with the topology



Page No

Date 4 / 10 / 24

Lab 2

Create a topology involving multiple hubs and a switch connecting them to simulate a single PDU

Topology:

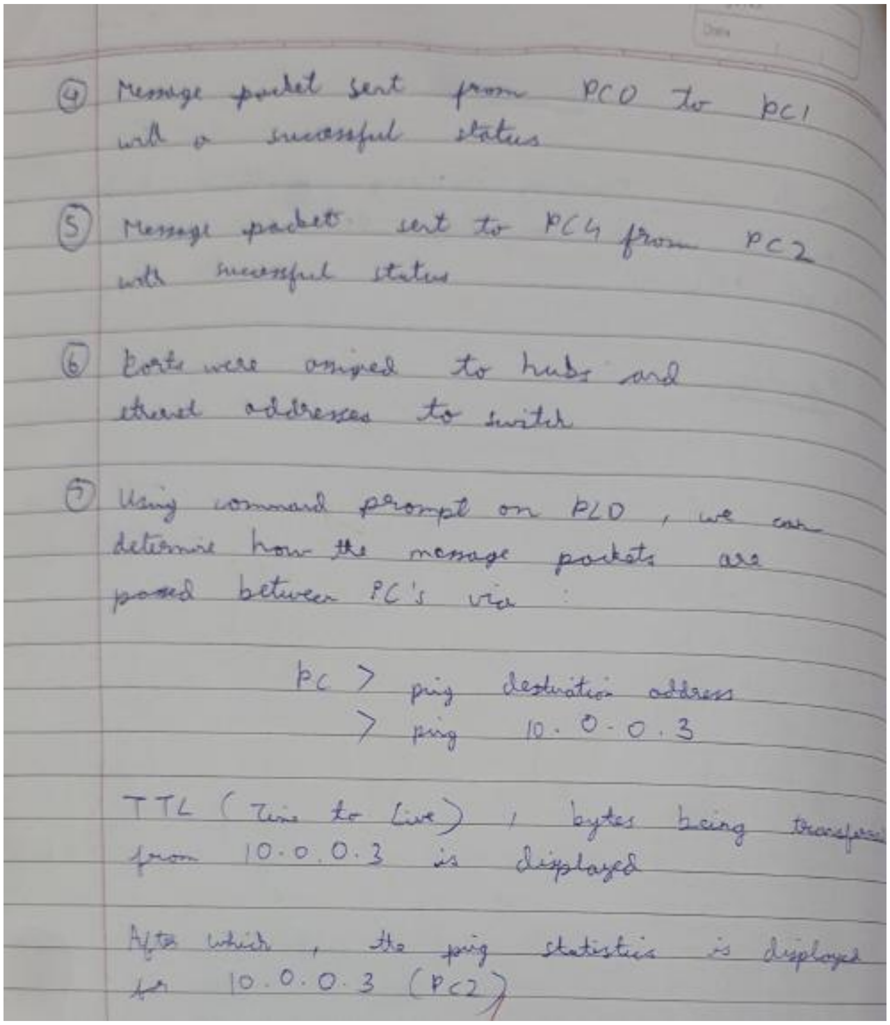
Key:
copper cross-over
copper straight
Fa 0/1
Fa 1/1
Switch 0
Hub 0
Hub 1
PC0
10.0.0.1
PC1
10.0.0.2
PC2
10.0.0.3
PC3
10.0.0.4
PC4
10.0.0.5
PC5
10.0.0.6

Steps:

① PCs connected to 2 hubs.
PC0, PC1, PC2 connected to hub 0
PC3, PC4, PC5 connected to hub 1

② Hub 0 & hub 1 are connected to a switch (switch 0)

③ PC's configured with respective unique IP addresses



④ Message packet sent from PC0 to PC1 with a successful status

⑤ Message packet sent to PC4 from PC2 with successful status

⑥ Ports were assigned to hubs and ethernet addresses to switch

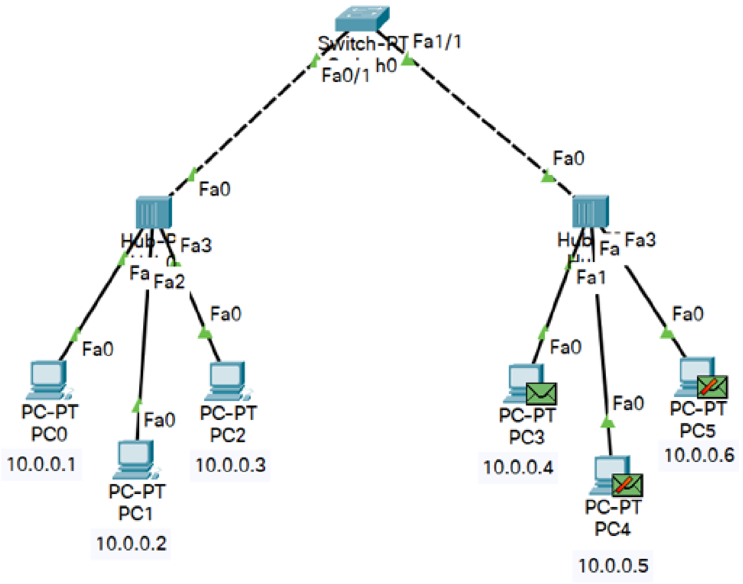
⑦ Using command prompt on PC0, we can determine how the message packets are passed between PC's via :

```
PC > ping destination address
   > ping 10.0.0.3
```

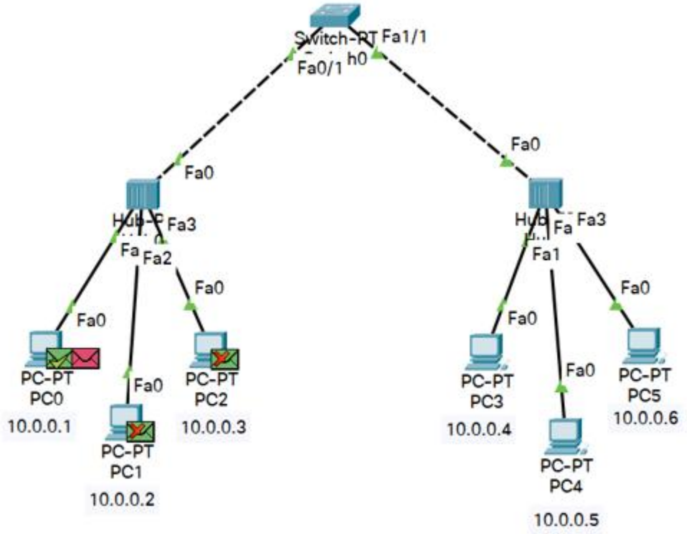
TTL (Time to Live), bytes being transfer from 10.0.0.3 is displayed

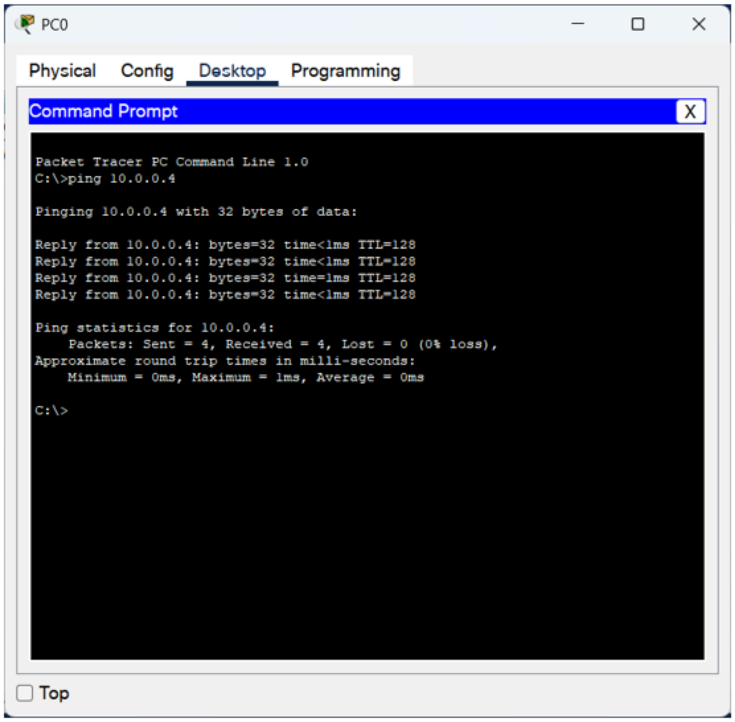
After which, the ping statistics is displayed for 10.0.0.3 (PC2)

iii. Screen shots/ output



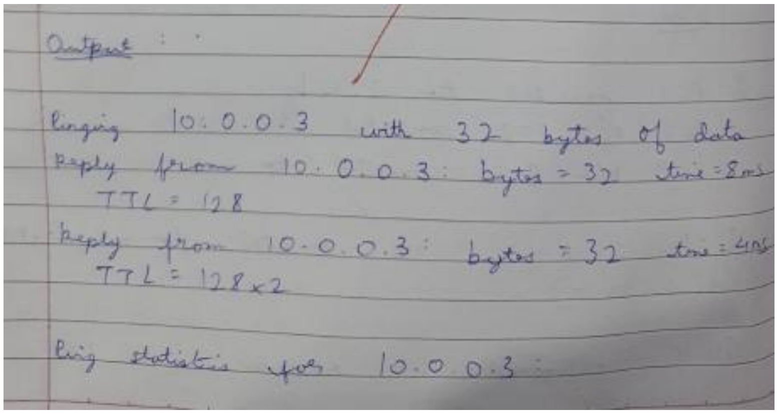
Switch-PT
Fa1/1
Fa0/1
h0
Fa0
Fa0
Hub-P
Fa3
Fa
Fa2
Fa0
Fa0
Fa0
Hub
Fa
Fa3
Fa1
Fa0
Fa0
Fa0
PC-PT
PC0
10.0.0.1
PC-PT
PC1
10.0.0.2
PC-PT
PC2
10.0.0.3
PC-PT
PC3
10.0.0.4
PC-PT
PC4
10.0.0.5
PC-PT
PC5
10.0.0.6


Switch-PT
Fa1/1
Fa0/1
Fa0
Hub-PT
Fa3
Fa2
Fa1
PC-PT PC0
10.0.0.1
PC-PT PC1
10.0.0.2
PC-PT PC2
10.0.0.3
PC-PT PC3
10.0.0.4
PC-PT PC4
10.0.0.5
PC-PT PC5
10.0.0.6


PC0
Physical
Config
Desktop
Programming
Command Prompt
X
☐ Top

```
Packet Tracer PC Command Line 1.0
C:\>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<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms 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

C:\>
```

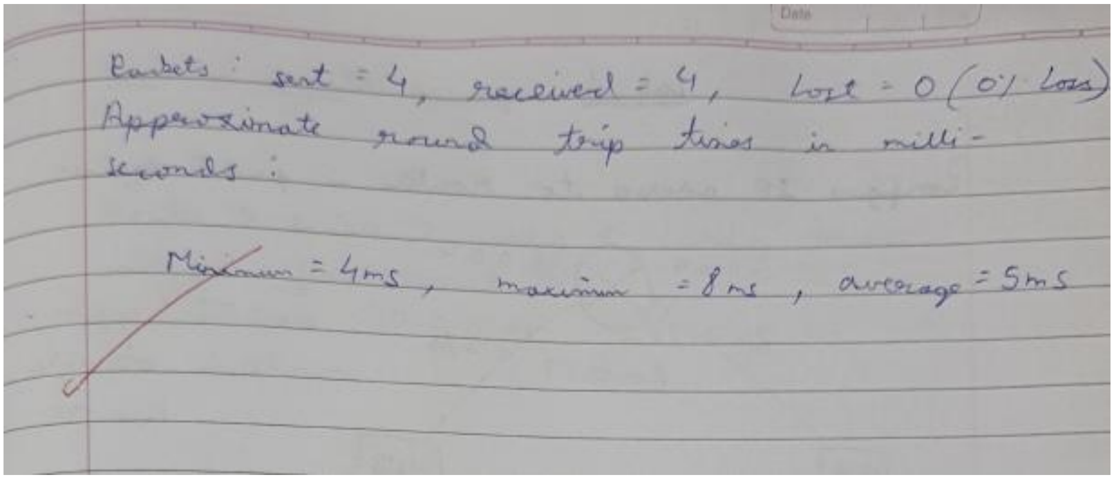
iv. Observation



Output :

Pinging 10.0.0.3 with 32 bytes of data
Reply from 10.0.0.3: bytes = 32 time = 8ms
TTL = 128
Reply from 10.0.0.3: bytes = 32 time = 4ms
TTL = 128×2

Ping statistics for 10.0.0.3 :



Date

Packets : sent = 4, received = 4, Lost = 0 (0% Loss)
Approximate round trip times in milli-seconds :

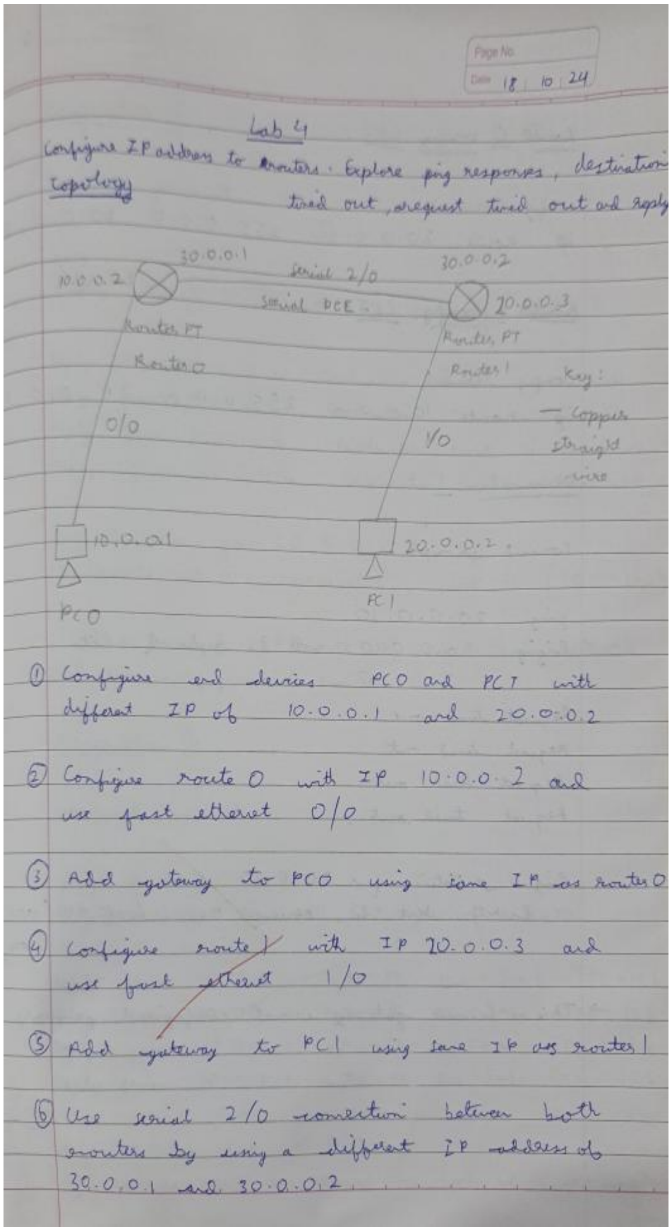
Minimum = 4ms , maximum = 8ms , average = 5ms

Program 2

i. Aim of the program

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

ii. Procedure along with the topology



Date 18 10 24

Lab 4

Configure IP address to routers. Explore ping responses, destinatio timed out, request timed out and reply

topology

10.0.0.2
30.0.0.1
Serial 2/0
Serial DCE
30.0.0.2
20.0.0.3
Router PT
Router0
Router PT
Router1
0/0
1/0
Key:
— Copper straight wire
10.0.0.1
20.0.0.2
PC0
PC1

① Configure end devices PC0 and PC1 with different IP of 10.0.0.1 and 20.0.0.2

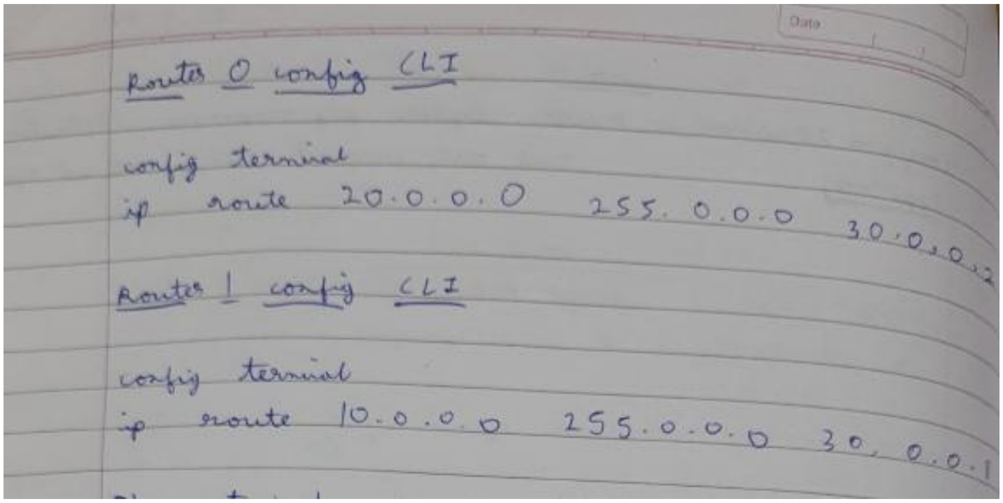
② Configure route 0 with IP 10.0.0.2 and use fast ethernet 0/0

③ Add gateway to PC0 using same IP as router0

④ Configure route 1 with IP 20.0.0.3 and use fast ethernet 1/0

⑤ Add gateway to PC1 using same IP as router1

⑥ Use serial 2/0 connection between both routers by using a different IP address of 30.0.0.1 and 30.0.0.2



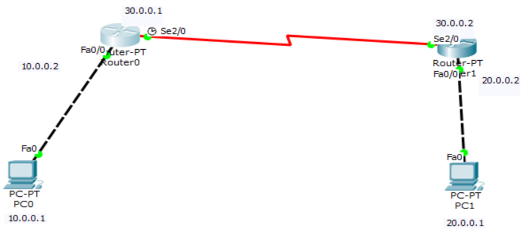
Router 0 config CLI

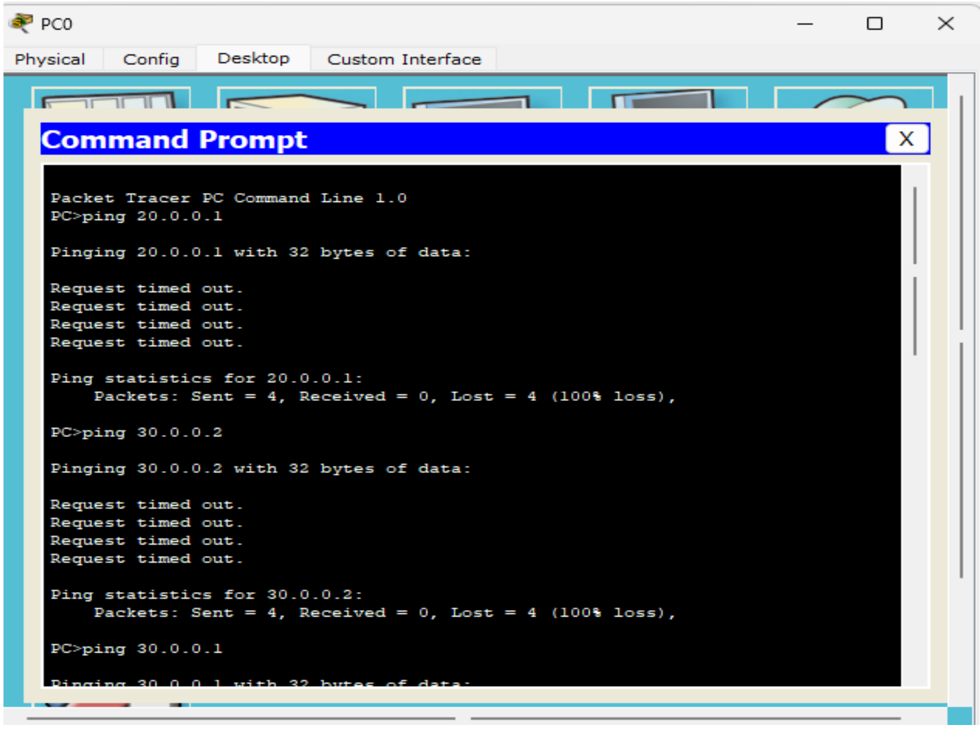
config terminal
ip route 20.0.0.0 255.0.0.0 30.0.0.2

Router 1 config CLI

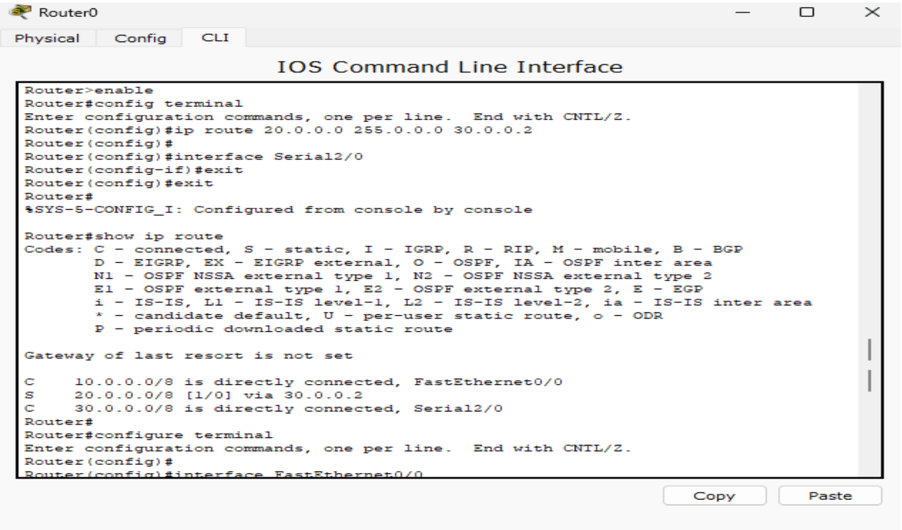
config terminal
ip route 10.0.0.0 255.0.0.0 30.0.0.1

iii. Screen shots/ output

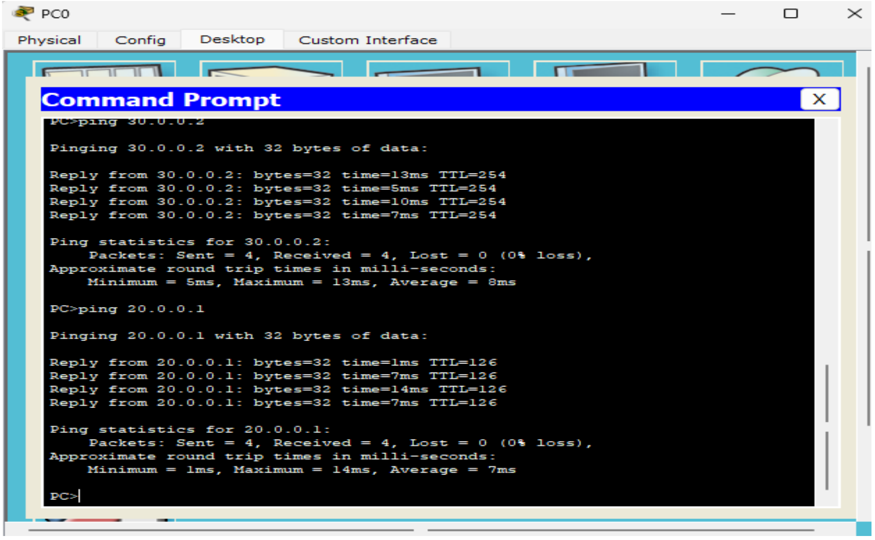

30.0.0.1
Se2/0
Fa0/0
Router-PT
Router0
10.0.0.2
30.0.0.2
Se2/0
Router-PT
Fa0/0
Router1
20.0.0.2
Fa0
PC-PT
PC0
10.0.0.1
Fa0
PC-PT
PC1
20.0.0.1


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X

```
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 30.0.0.2

Pinging 30.0.0.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 30.0.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 30.0.0.1

Pinging 30.0.0.1 with 32 bytes of data:
```

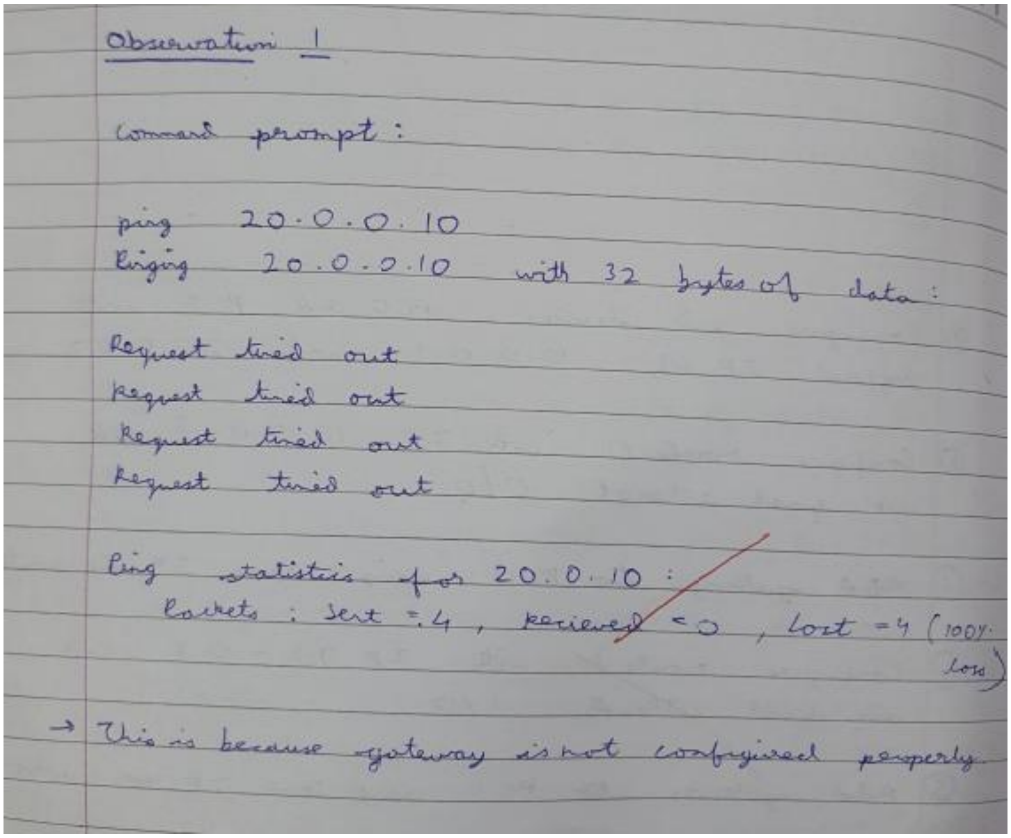


```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.2
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by 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

C    10.0.0.0/8 is directly connected, FastEthernet0/0
S    20.0.0.0/8 [1/0] via 30.0.0.2
C    30.0.0.0/8 is directly connected, Serial2/0
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#interface FastEthernet0/0
```



```
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=13ms TTL=254
Reply from 30.0.0.2: bytes=32 time=5ms TTL=254
Reply from 30.0.0.2: bytes=32 time=10ms TTL=254
Reply from 30.0.0.2: bytes=32 time=7ms TTL=254

Ping statistics for 30.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 13ms, Average = 8ms

PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time=1ms TTL=126
Reply from 20.0.0.1: bytes=32 time=7ms TTL=126
Reply from 20.0.0.1: bytes=32 time=14ms TTL=126
Reply from 20.0.0.1: bytes=32 time=7ms TTL=126

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 14ms, Average = 7ms

PC>
```

iv. Observation

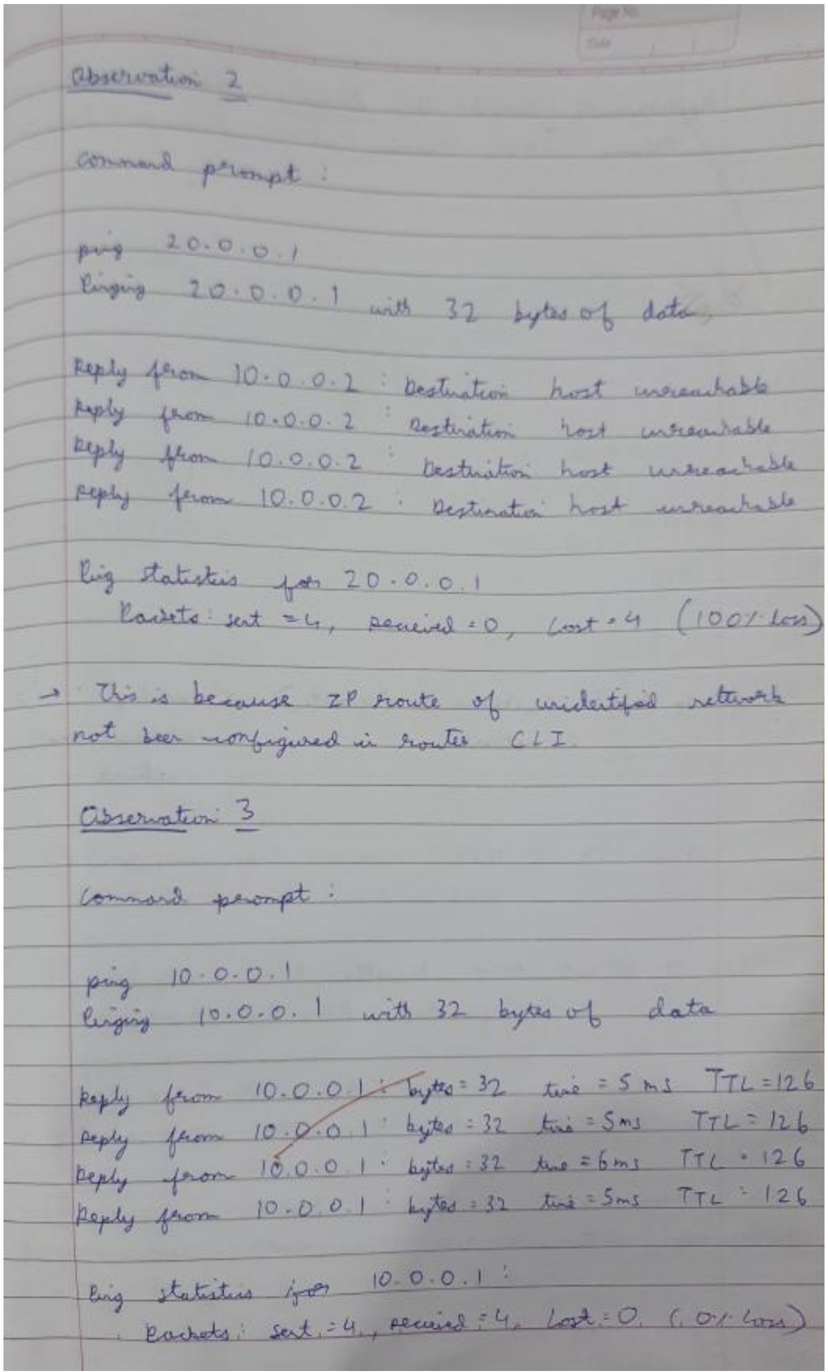


Observation 1

Command prompt :

```
ping    20.0.0.10
Pinging    20.0.0.10    with 32 bytes of data :

Request timed out
Request timed out
Request timed out
Request timed out

Ping statistics for 20.0.10 :
    Packets : Sent = 4 , Recieved = 0 , Lost = 4 (100% loss)
```

→ This is because gateway is not configured properly.



Page No.
Date

Observation 2

Command prompt :

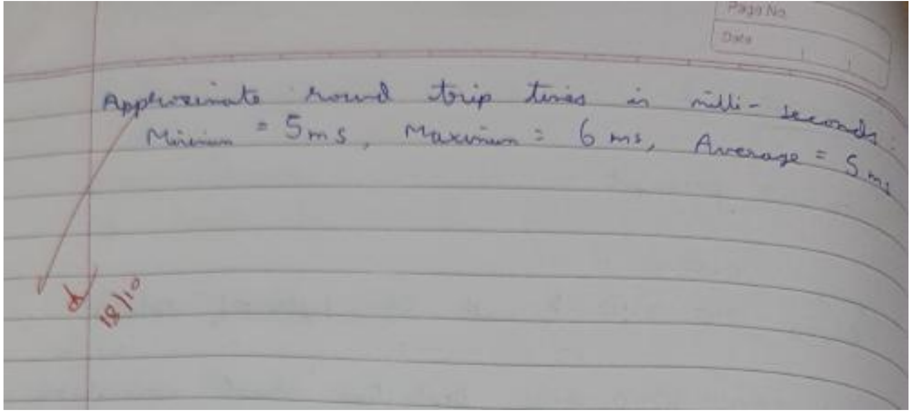
```
ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data.

Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable

Ping statistics for 20.0.0.1
   Packets: sent = 4, Received = 0, Lost = 4 (100% loss)
```

→ This is because IP route of unidentified network not been configured in router CLI.

Observation 3

Command prompt :

```
ping 10.0.0.1
Pinging 10.0.0.1 with 32 bytes of data

Reply from 10.0.0.1 : bytes = 32  time = 5 ms  TTL = 126
Reply from 10.0.0.1 : bytes = 32  time = 5ms   TTL = 126
Reply from 10.0.0.1 : bytes = 32  time = 6ms   TTL = 126
Reply from 10.0.0.1 : bytes = 32  time = 5ms   TTL = 126

Ping statistics for 10.0.0.1 :
   Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
```



Page No.
Date

```
Approximate round trip times in milli-seconds:
   Minimum = 5ms, Maximum = 6 ms, Average = 5 ms
```

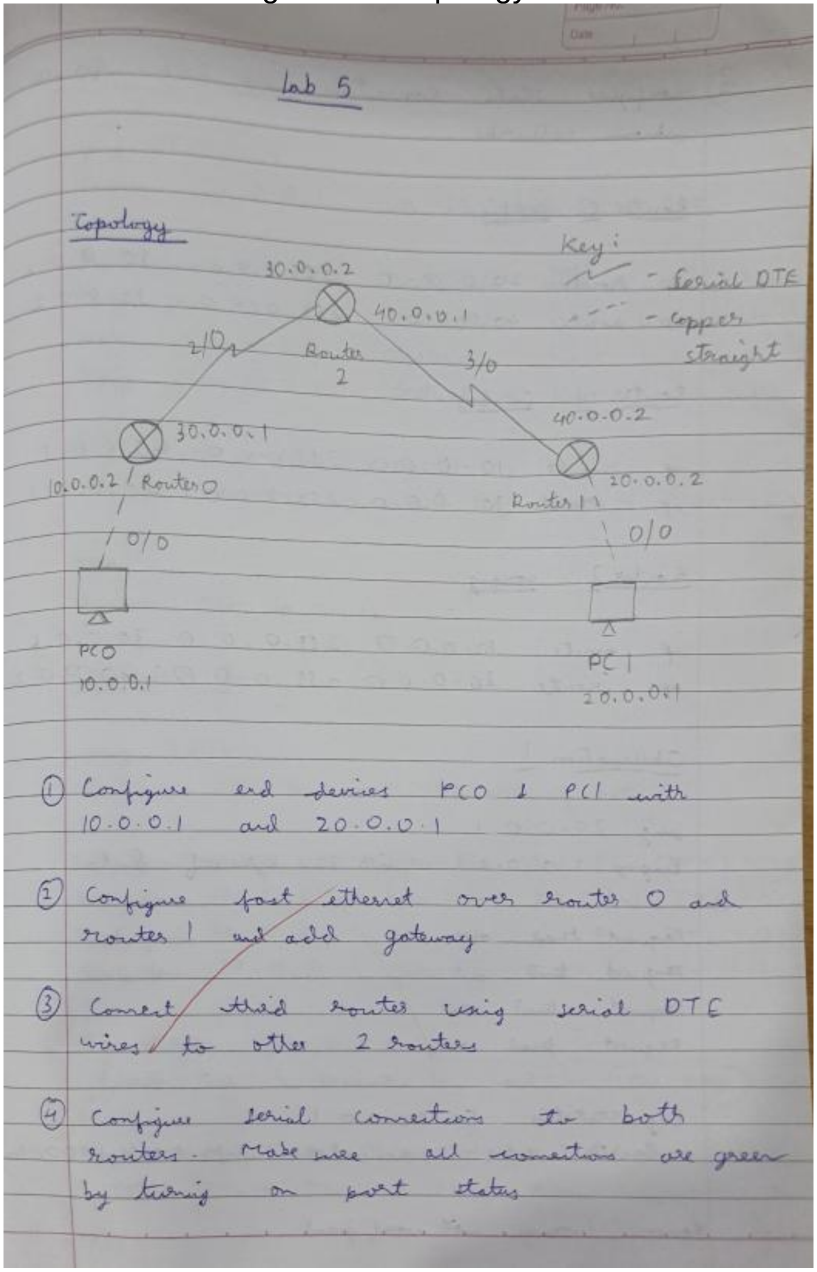
18/10

Program 3

i. Aim of the program

Configure default route, static route to the Route

ii. Procedure along with the topology



Lab 5

Topology

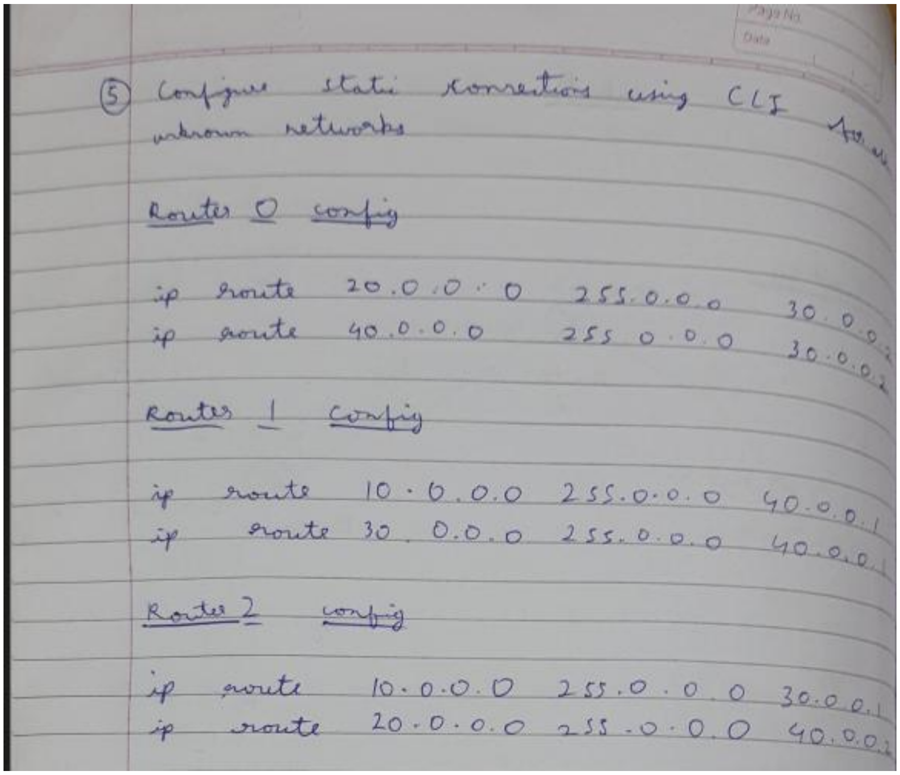
30.0.0.2
40.0.0.1
2/0
Router 2
3/0
30.0.0.1
40.0.0.2
10.0.0.2
Router 0
20.0.0.2
Router 1
0/0
0/0
PC0
10.0.0.1
PC 1
20.0.0.1
Key:
- Serial DTE
- copper straight

① Configure end devices PC0 & PC1 with 10.0.0.1 and 20.0.0.1

② Configure fast ethernet over router 0 and router 1 and add gateway

③ Connect third router using serial DTE wires to other 2 routers

④ Configure serial connections to both routers. Make sure all connections are green by turning on port status



Page No.
Date

⑤ Configure static connections using CLI for u
unknown networks

Router 0 config

```
ip route 20.0.0.0 255.0.0.0 30.0.0.2
ip route 40.0.0.0 255 0.0.0 30.0.0.2
```

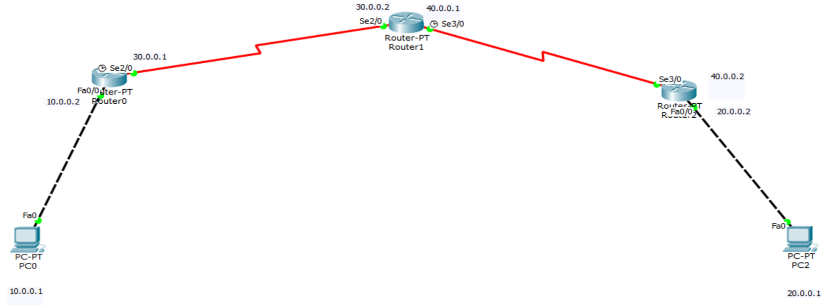
Router 1 config

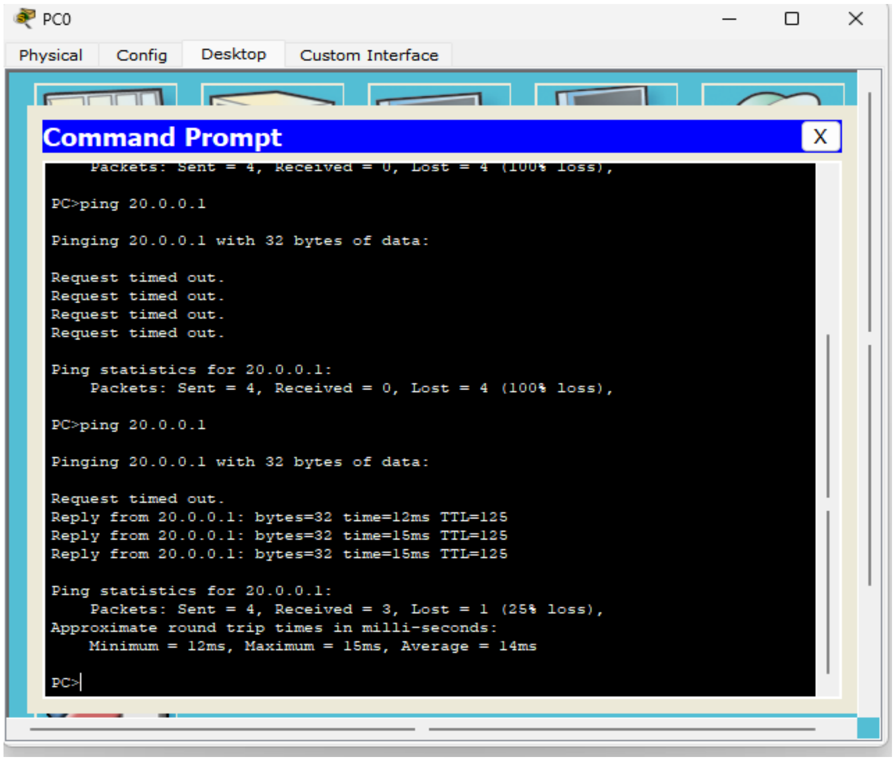
```
ip route 10.0.0.0 255.0.0.0 40.0.0.1
ip route 30.0.0.0 255.0.0.0 40.0.0.1
```

Router 2 config

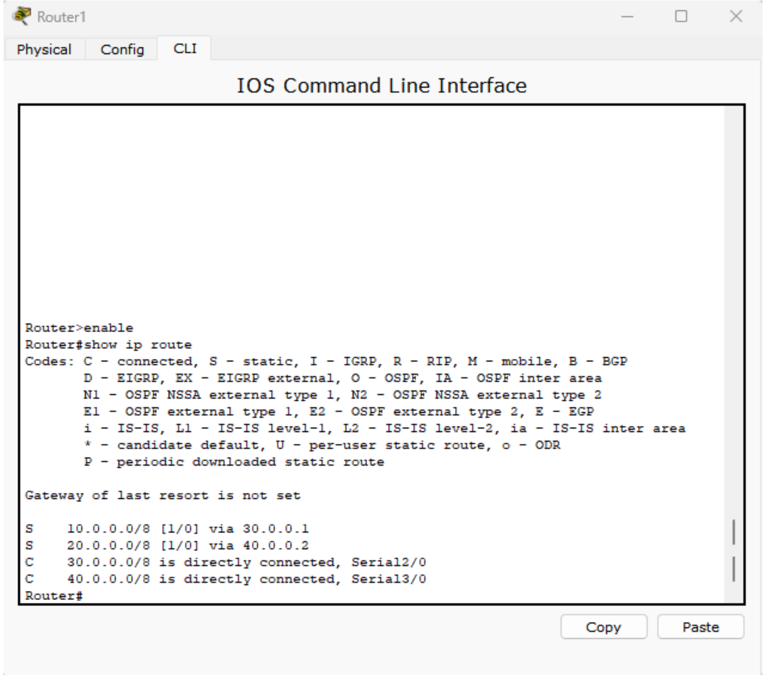
```
ip route 10.0.0.0 255.0.0.0 30.0.0.1
ip route 20.0.0.0 255.0.0.0 40.0.0.2
```

iii. Screen shots/ output

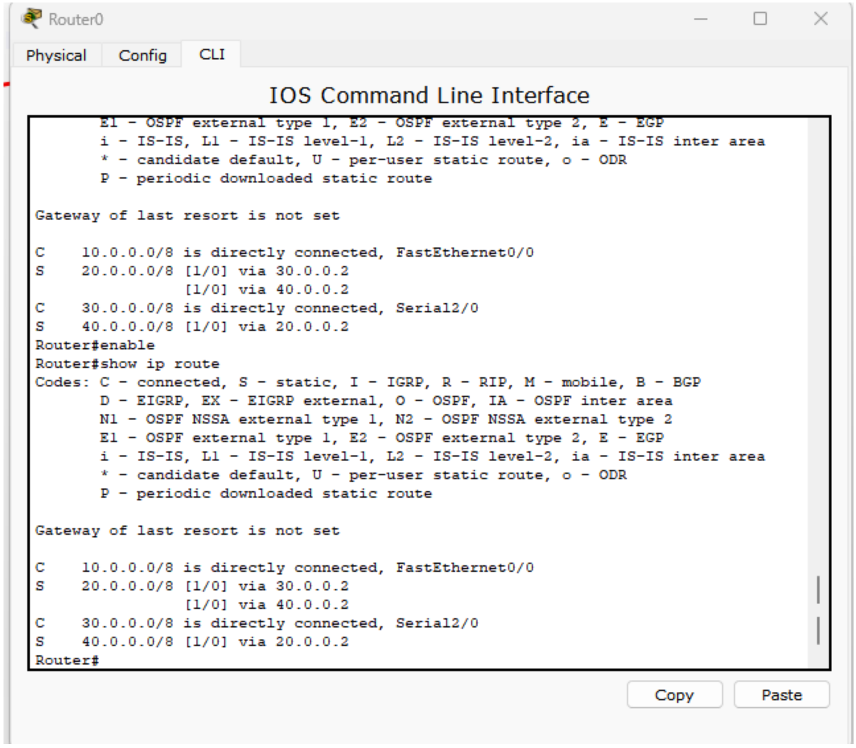

30.0.0.2
40.0.0.1
Se2/0
Se3/0
Router-PT
Router1
30.0.0.1
Se2/0
Fa0/0
Router-PT
Router0
10.0.0.2
Se3/0
40.0.0.2
Router-PT
Fa0/0
20.0.0.2
Fa0
PC-PT
PC0
10.0.0.1
Fa0
PC-PT
PC2
20.0.0.1


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X

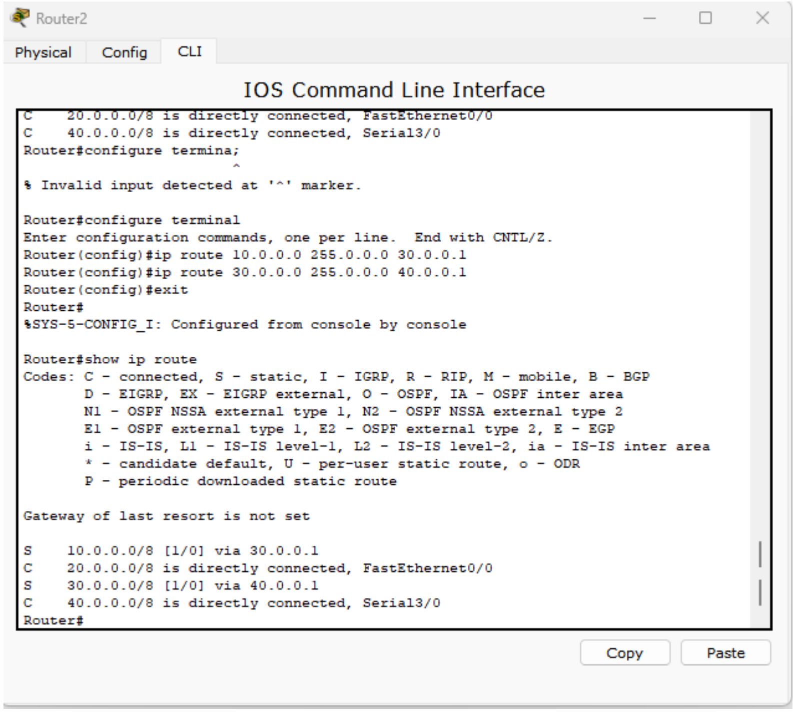
```
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

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=12ms TTL=125
Reply from 20.0.0.1: bytes=32 time=15ms TTL=125
Reply from 20.0.0.1: bytes=32 time=15ms TTL=125

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 12ms, Maximum = 15ms, Average = 14ms

PC>
```


Router1
Physical
Config
CLI
IOS Command Line Interface
Copy
Paste

```
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

S    10.0.0.0/8 [1/0] via 30.0.0.1
S    20.0.0.0/8 [1/0] via 40.0.0.2
C    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, Serial3/0
Router#
```

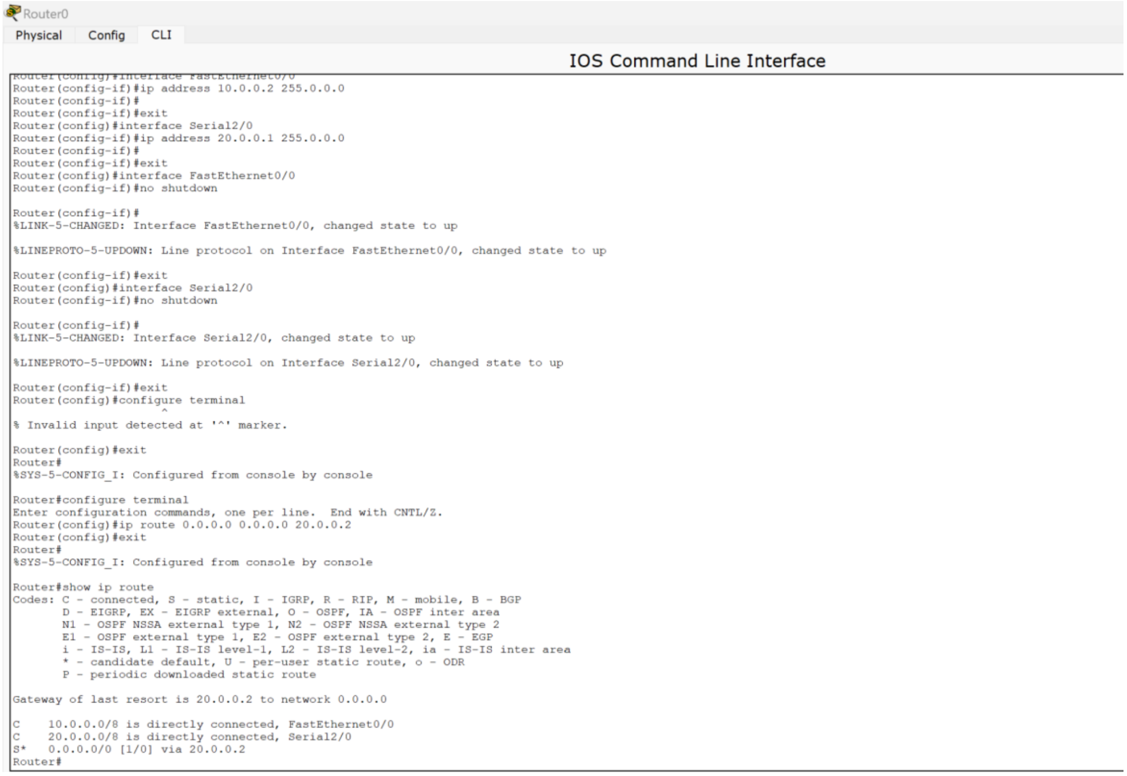


```
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
S    20.0.0.0/8 [1/0] via 30.0.0.2
                [1/0] via 40.0.0.2
C    30.0.0.0/8 is directly connected, Serial2/0
S    40.0.0.0/8 [1/0] via 20.0.0.2
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
S    20.0.0.0/8 [1/0] via 30.0.0.2
                [1/0] via 40.0.0.2
C    30.0.0.0/8 is directly connected, Serial2/0
S    40.0.0.0/8 [1/0] via 20.0.0.2
Router#
```

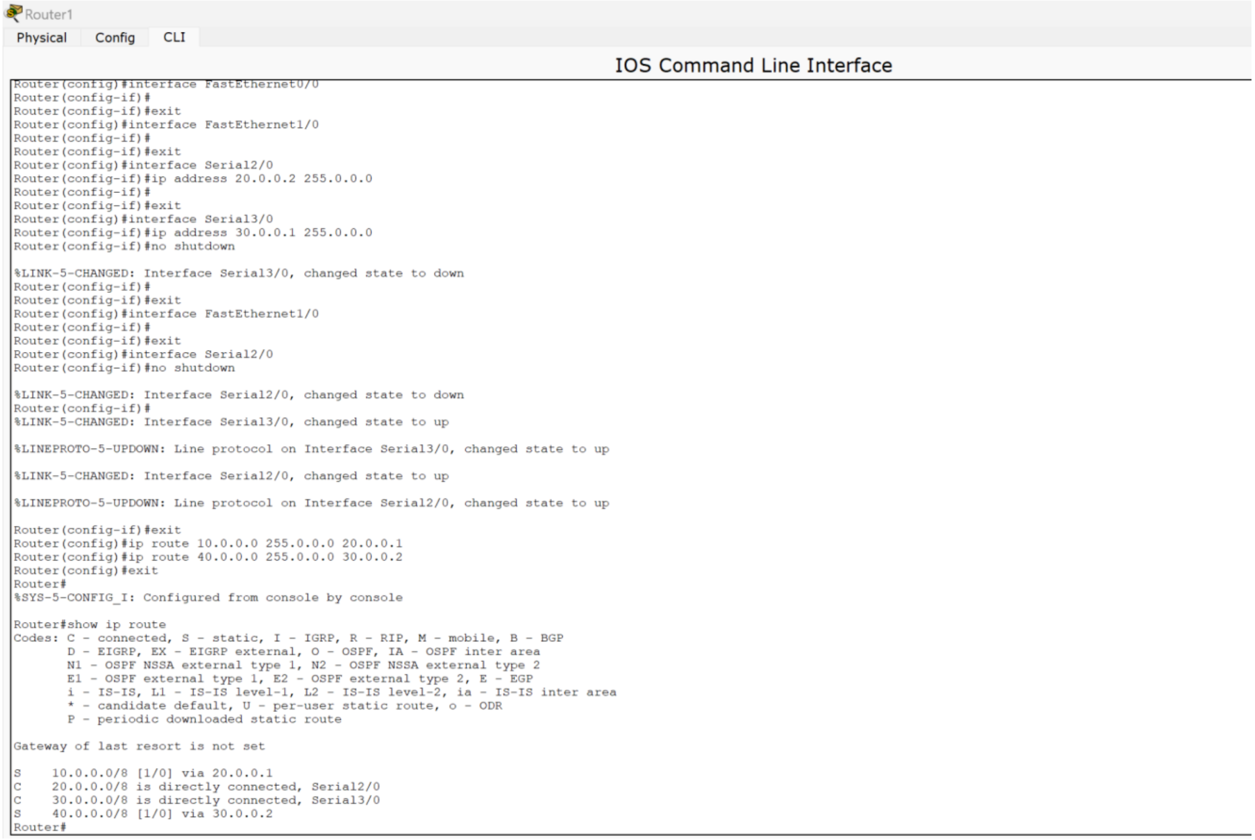


```
C    20.0.0.0/8 is directly connected, FastEthernet0/0
C    40.0.0.0/8 is directly connected, Serial3/0
Router#configure termina;
                        ^
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.1
Router(config)#ip route 30.0.0.0 255.0.0.0 40.0.0.1
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

S    10.0.0.0/8 [1/0] via 30.0.0.1
C    20.0.0.0/8 is directly connected, FastEthernet0/0
S    30.0.0.0/8 [1/0] via 40.0.0.1
C    40.0.0.0/8 is directly connected, Serial3/0
Router#
```

Default Routing:

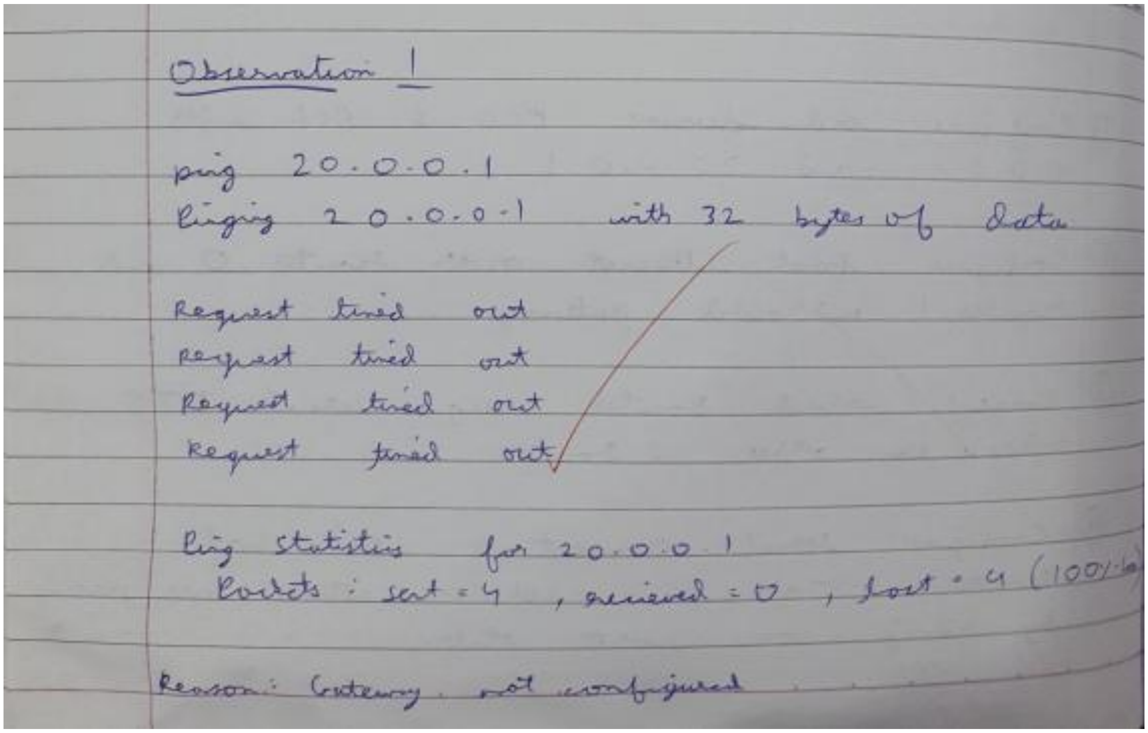


```
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

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

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

Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

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

Router(config-if)#exit
Router(config)#configure terminal
                     ^
% Invalid input detected at '^' marker.

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

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.2
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 20.0.0.2 to network 0.0.0.0

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 20.0.0.2
Router#
```



```
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

%LINK-5-CHANGED: Interface Serial2/0, changed state to up

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

Router(config-if)#exit
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
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

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#
```

iv. Observation



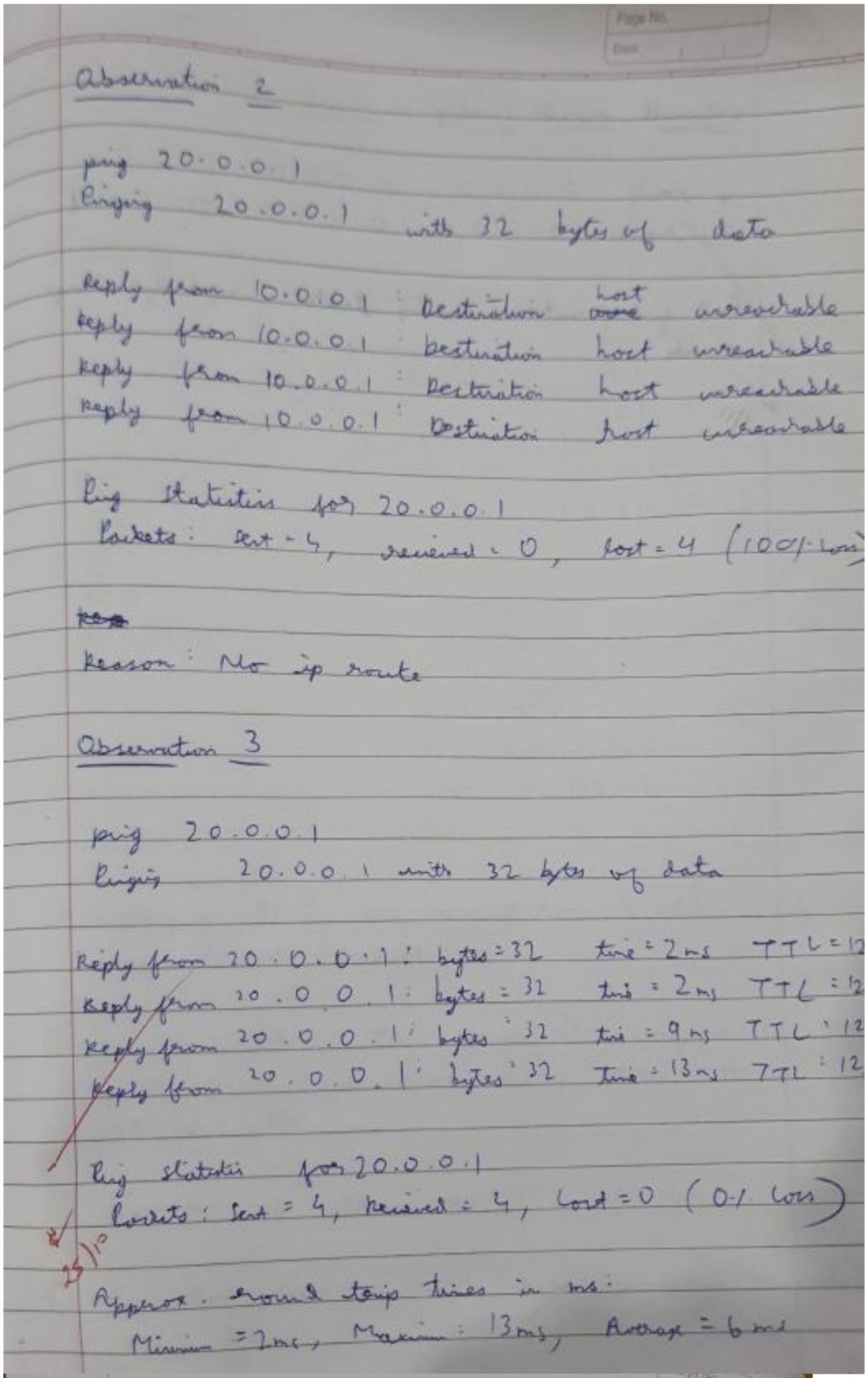
Observation !

ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of Data

Request timed out
Request timed out
Request timed out
Request timed out

Ping statistics for 20.0.0.1
Packets : sent = 4 , recieved = 0 , lost = 4 (100% lo

Reason: Gateway not configured



Observation 2

```
ping 20.0.0.1
Pinging 20.0.0.1 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 20.0.0.1
 Packets: Sent = 4, received = 0, lost = 4 (100% loss)
```

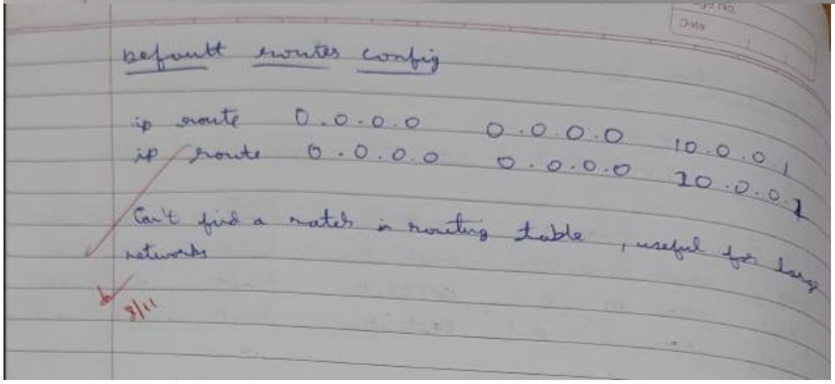
~~Rea~~

Reason : No ip route

Observation 3

```
ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data

Reply from 20.0.0.1: bytes=32 time=2ms TTL=12
Reply from 20.0.0.1: bytes = 32 time = 2ms TTL = 12
Reply from 20.0.0.1: bytes = 32 time = 9ms TTL = 12
Reply from 20.0.0.1: bytes = 32 Time = 13ms TTL = 12

Ping statistics for 20.0.0.1
 Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

Approx. round trip times in ms:
 Minimum = 2ms, Maximum = 13ms, Average = 6ms
```

25/10



Default router config

```
ip route 0.0.0.0 0.0.0.0 10.0.0.1
ip route 0.0.0.0 0.0.0.0 20.0.0.1
```

Can't find a match in routing table, useful for large networks

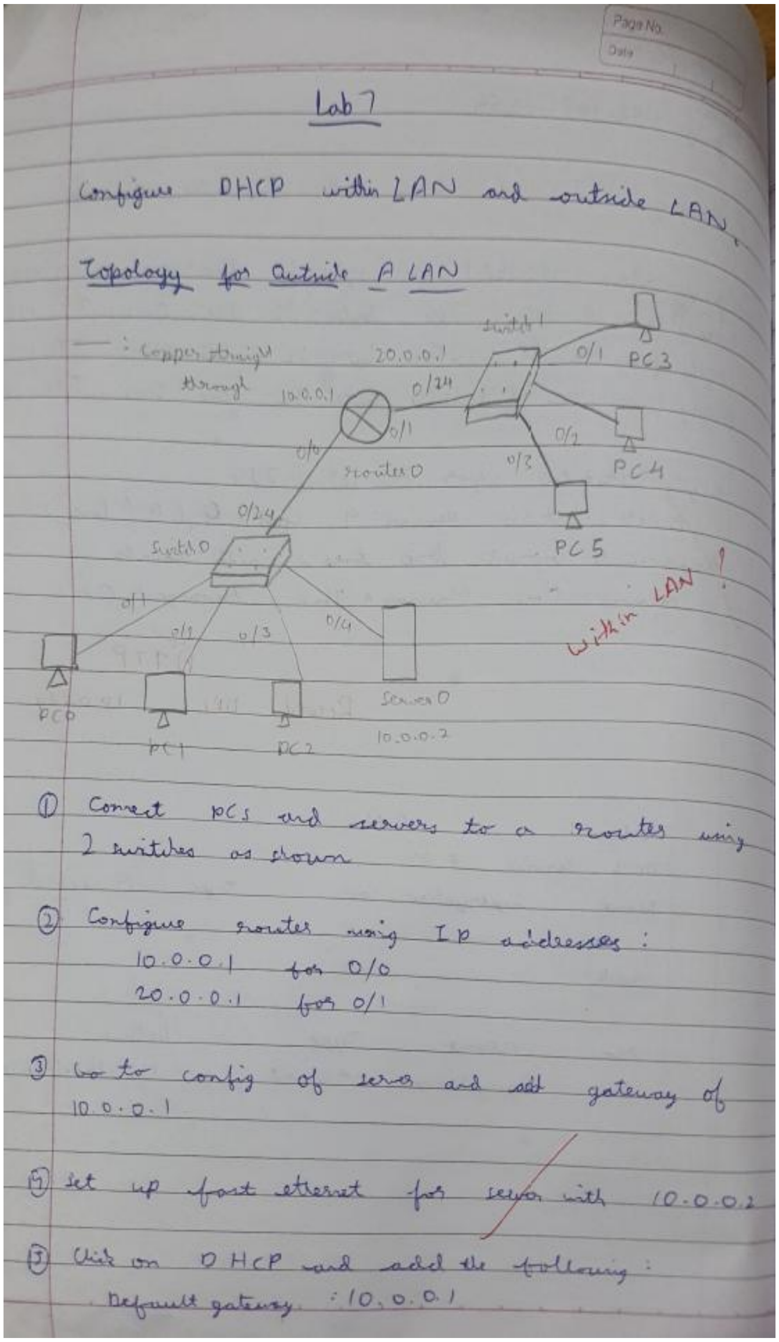
8/11

Program 4

i. Aim of the program

Configure DHCP within a LAN and outside LAN.

ii. Procedure along with the topology



Page No.
Date
— : Copper straight through
10.0.0.1
20.0.0.1
0/24
0/1
0/0
router0
switch1
0/1
PC3
0/2
PC4
0/3
PC5
0/24
switch0
0/1
0/2
0/3
0/4
Server0
10.0.0.2
PC0
PC1
PC2
within LAN !

Lab 7

Configure DHCP within LAN and outside LAN.

Topology for Outside A LAN

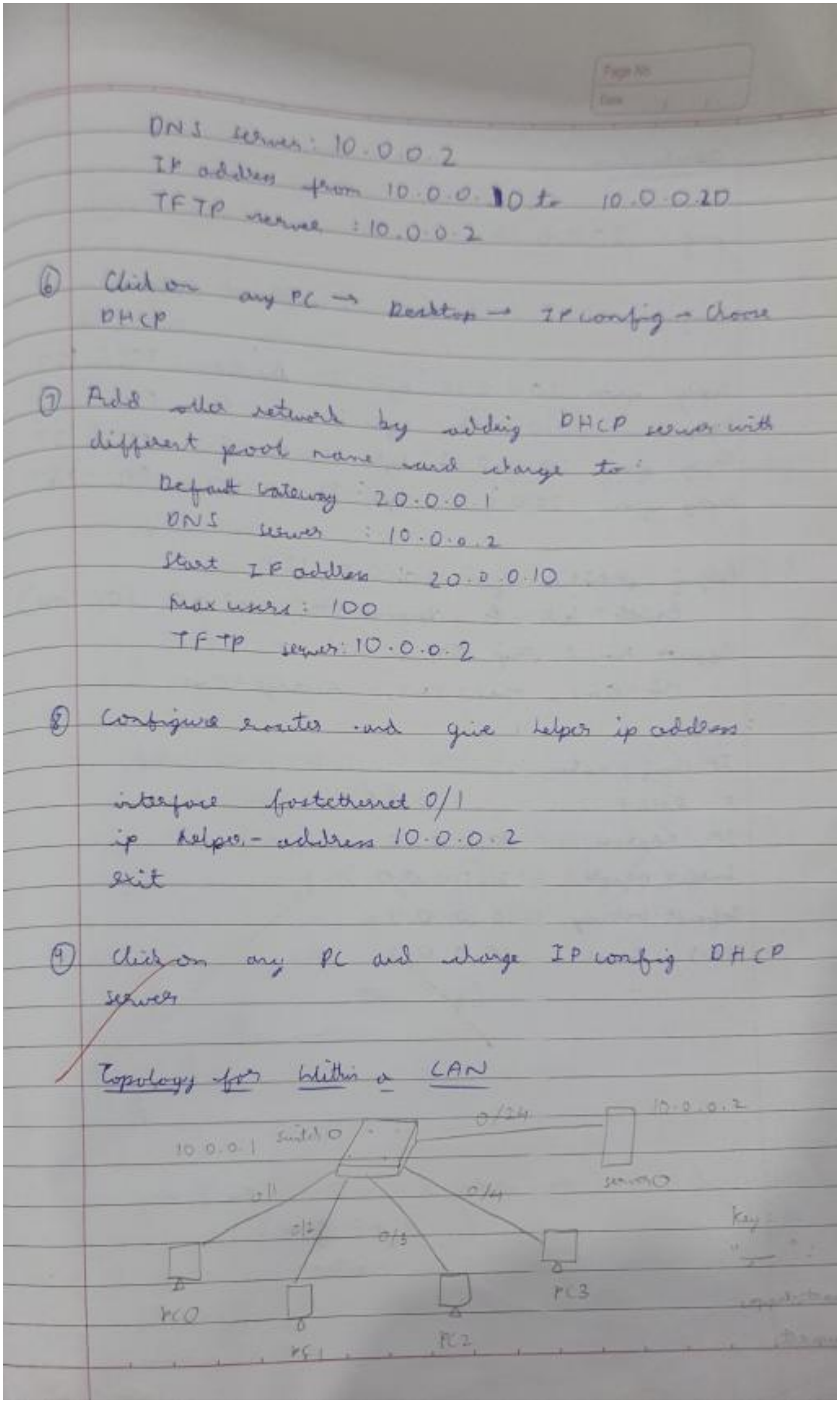
① Connect PCs and servers to a router using 2 switches as shown

② Configure router using IP addresses :
10.0.0.1 for 0/0
20.0.0.1 for 0/1

③ Go to config of server and add gateway of 10.0.0.1

④ Set up fast ethernet for server with 10.0.0.2

⑤ Click on DHCP and add the following :
Default gateway : 10.0.0.1



DNS server: 10.0.0.2
IP address from 10.0.0.10 to 10.0.0.20
TFTP server : 10.0.0.2

⑥ Click on any PC → Desktop → IP config → Choose DHCP

⑦ Add other network by adding DHCP server with different pool name and change to:

Default Gateway : 20.0.0.1
DNS server : 10.0.0.2
Start IP address : 20.0.0.10
Max users : 100
TFTP server: 10.0.0.2

⑧ Configure router and give helper ip address

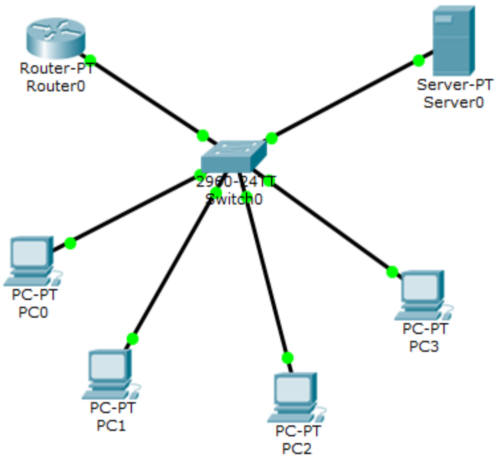
```
interface fastethernet 0/1
ip helper-address 10.0.0.2
exit
```

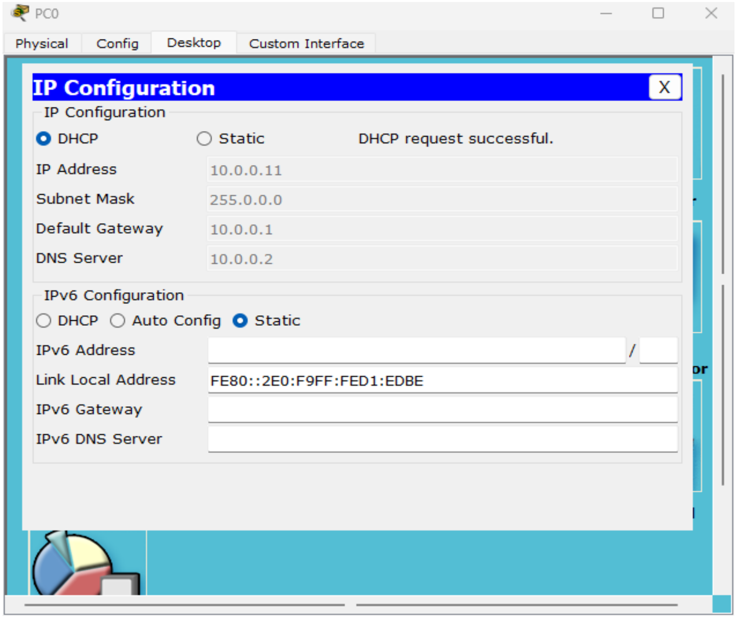
⑨ Click on any PC and change IP config DHCP server

Topology for within a LAN

10.0.0.1
Switch0
0/24
10.0.0.2
Server0
0/1
0/2
0/3
0/4
PC0
PC1
PC2
PC3
Key

iii. Screen shots/ output


Router-PT
Router0
Server-PT
Server0
2960-24TT
Switch0
PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3


PC0
Physical
Config
Desktop
Custom Interface
X

IP Configuration

IP Configuration

● DHCP ○ Static DHCP request successful.

IP Address 10.0.0.11

Subnet Mask 255.0.0.0

Default Gateway 10.0.0.1

DNS Server 10.0.0.2

IPv6 Configuration

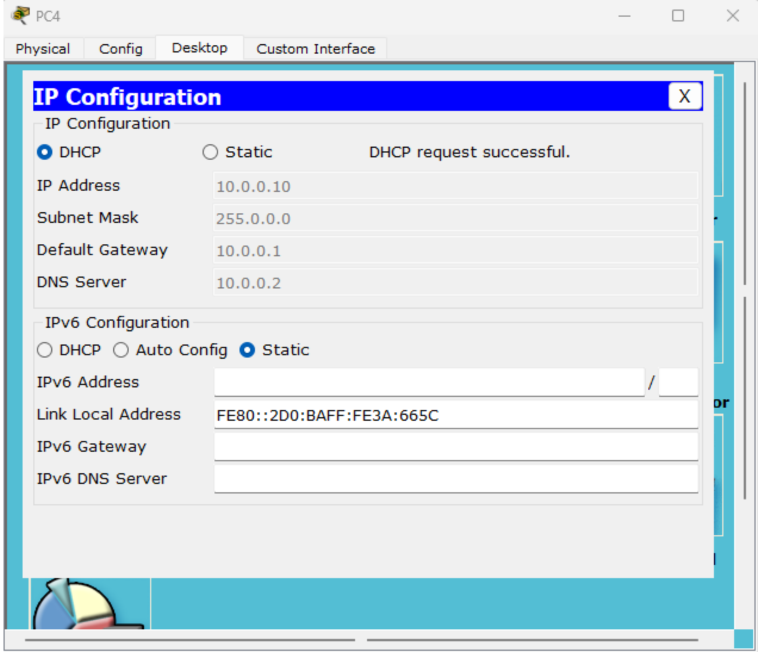
○ DHCP ○ Auto Config ● Static

IPv6 Address /

Link Local Address FE80::2E0:F9FF:FED1:EDBE

IPv6 Gateway

IPv6 DNS Server


PC4
Physical
Config
Desktop
Custom Interface
X

IP Configuration

IP Configuration

● DHCP ○ Static DHCP request successful.

IP Address 10.0.0.10

Subnet Mask 255.0.0.0

Default Gateway 10.0.0.1

DNS Server 10.0.0.2

IPv6 Configuration

○ DHCP ○ Auto Config ● Static

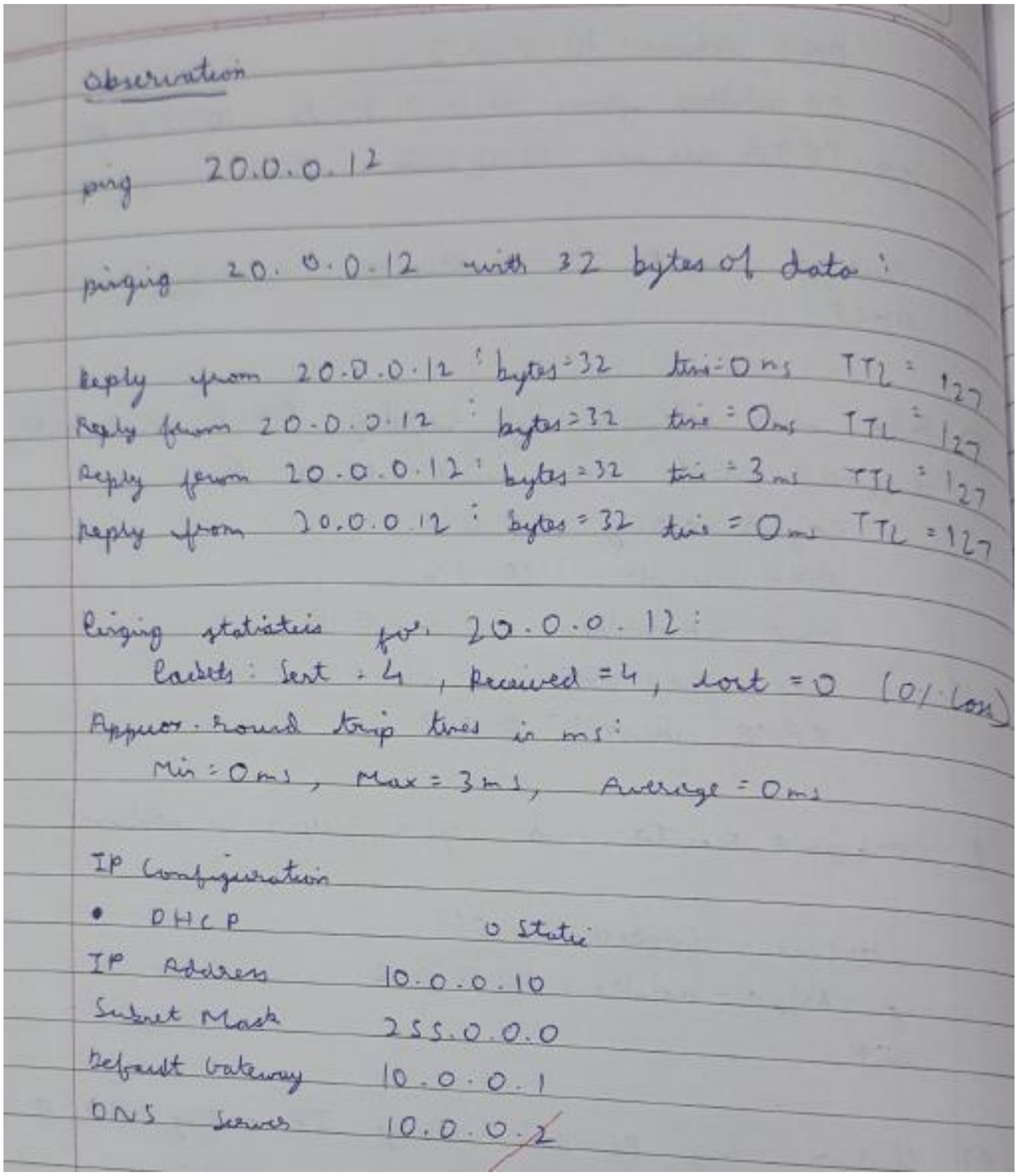
IPv6 Address /

Link Local Address FE80::2D0:BAFF:FE3A:665C

IPv6 Gateway

IPv6 DNS Server

iv. Observation



Observation

ping 20.0.0.12

pinging 20.0.0.12 with 32 bytes of data:

Reply from 20.0.0.12: bytes=32 time=0ms TTL = 127
Reply from 20.0.0.12 : bytes=32 time = 0ms TTL = 127
Reply from 20.0.0.12: bytes=32 time = 3ms TTL = 127
Reply from 20.0.0.12 : bytes = 32 time = 0ms TTL = 127

Pinging statistics for 20.0.0.12:
Packets: Sent = 4, Received = 4, Lost = 0 (0% Loss)
Approx. round trip times in ms:
Min = 0ms, Max = 3ms, Average = 0ms

IP Configuration

● DHCP ○ Static

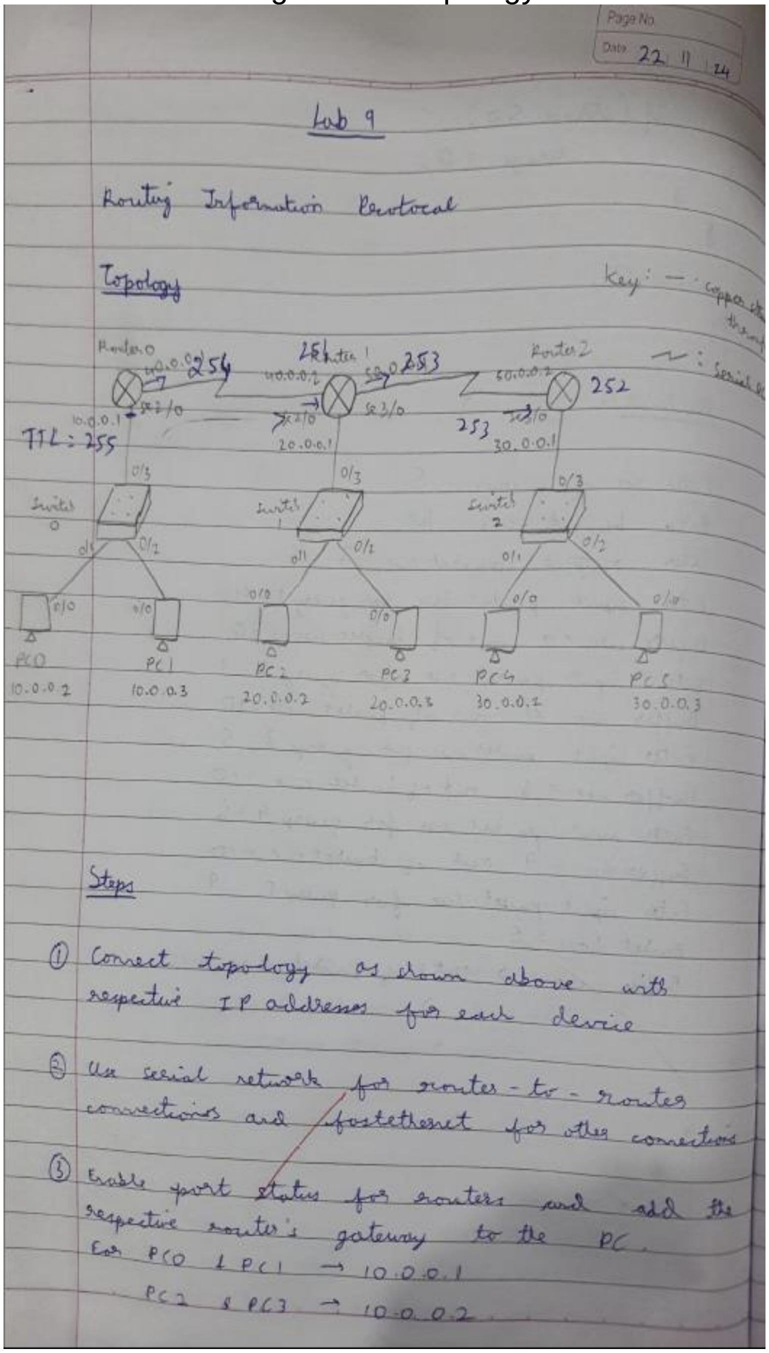
IP Address	10.0.0.10
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	10.0.0.2

Program 5

i. Aim of the program

Configure RIP routing Protocol in Routers

ii. Procedure along with the topology


Page No.
Date 22 11 24
Key: — : copper st… through…
~ : Serial …
Router0
40.0.0.1 256
Se2/0
10.0.0.1
TTL: 255
255 Router1
40.0.0.2
50.0.0.1 253
Se2/0
Se3/0
20.0.0.1
Router2
50.0.0.2
252
253
Se3/0
30.0.0.1
0/3
Switch 0
0/1
0/2
Switch 1
Switch 2
0/0
PC0
10.0.0.2
PC1
10.0.0.3
PC2
20.0.0.2
PC3
20.0.0.3
PC4
30.0.0.2
PC5
30.0.0.3

Lab 9

Routing Information Protocol

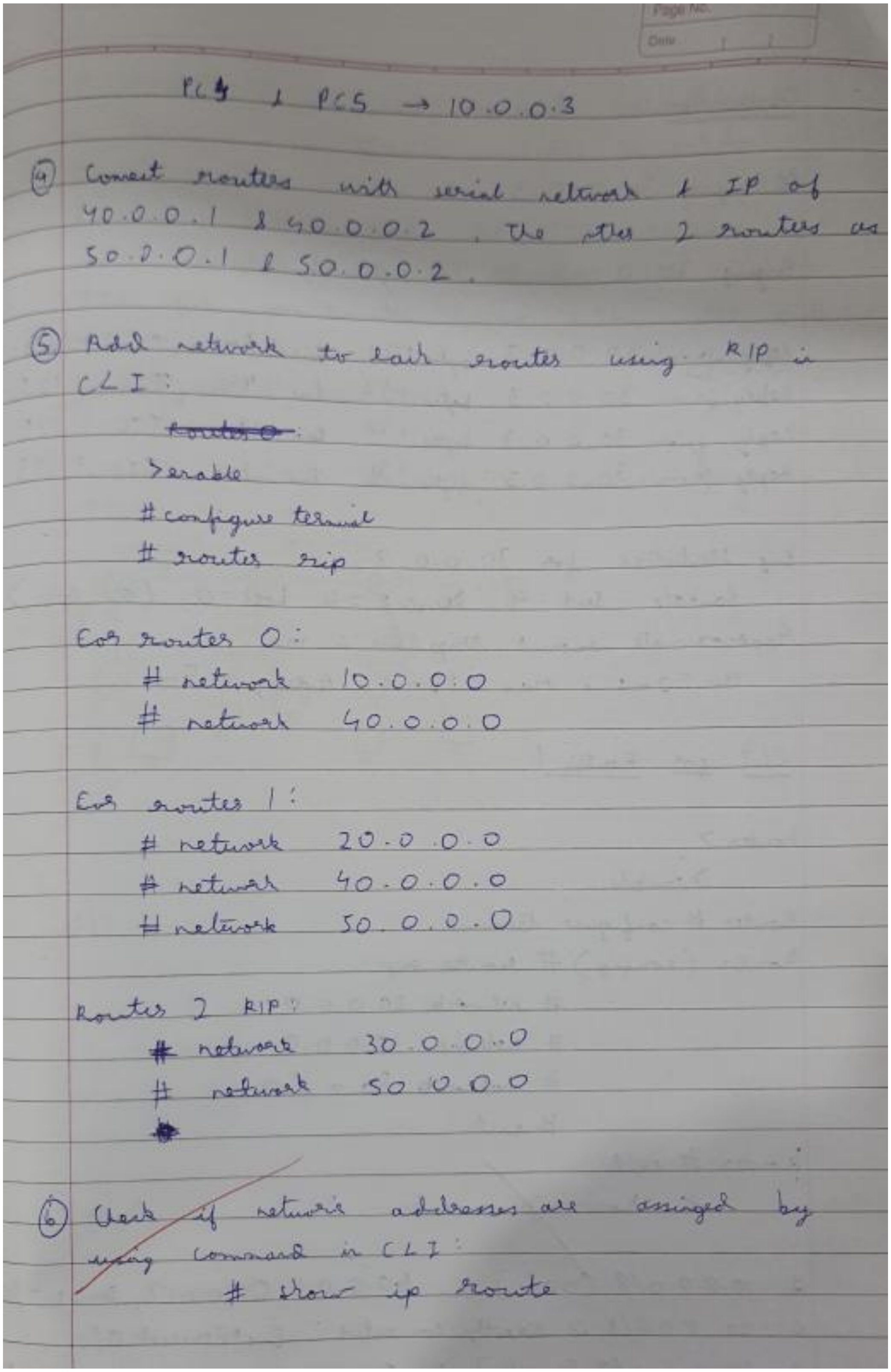
Topology

Steps

① Connect topology as shown above with respective IP addresses for each device

② Use serial network for router-to-router connections and fastethernet for other connections

③ Enable port status for routers and add the respective router's gateway to the PC.
For PC0 & PC1 → 10.0.0.1
PC2 & PC3 → 10.0.0.2



Page No.
Date

PC4 & PC5 → 10.0.0.3

(4) Connect routers with serial network & IP of 40.0.0.1 & 40.0.0.2. The other 2 routers as 50.0.0.1 & 50.0.0.2.

(5) Add network to each routers using RIP in CLI:

~~Router 0~~:

```
>enable
#configure terminal
# router rip
```

For router 0:

```
# network 10.0.0.0
# network 40.0.0.0
```

For router 1:

```
# network 20.0.0.0
# network 40.0.0.0
# network 50.0.0.0
```

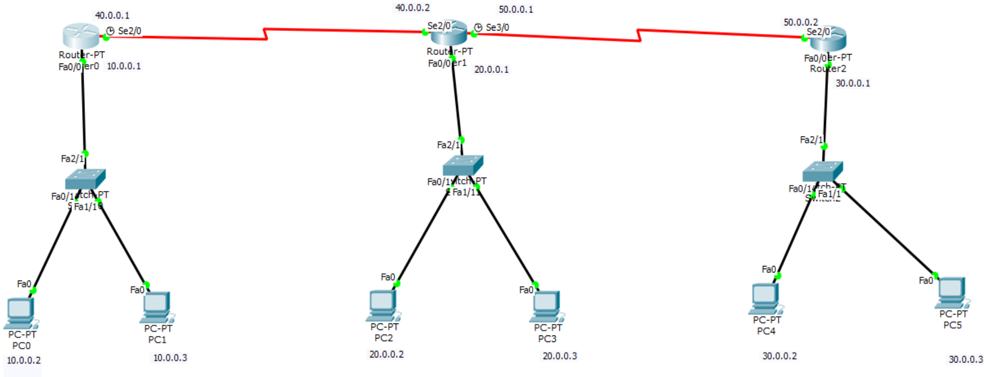
Router 2 RIP:

```
# network 30.0.0..0
# network 50.0.0.0
#
```

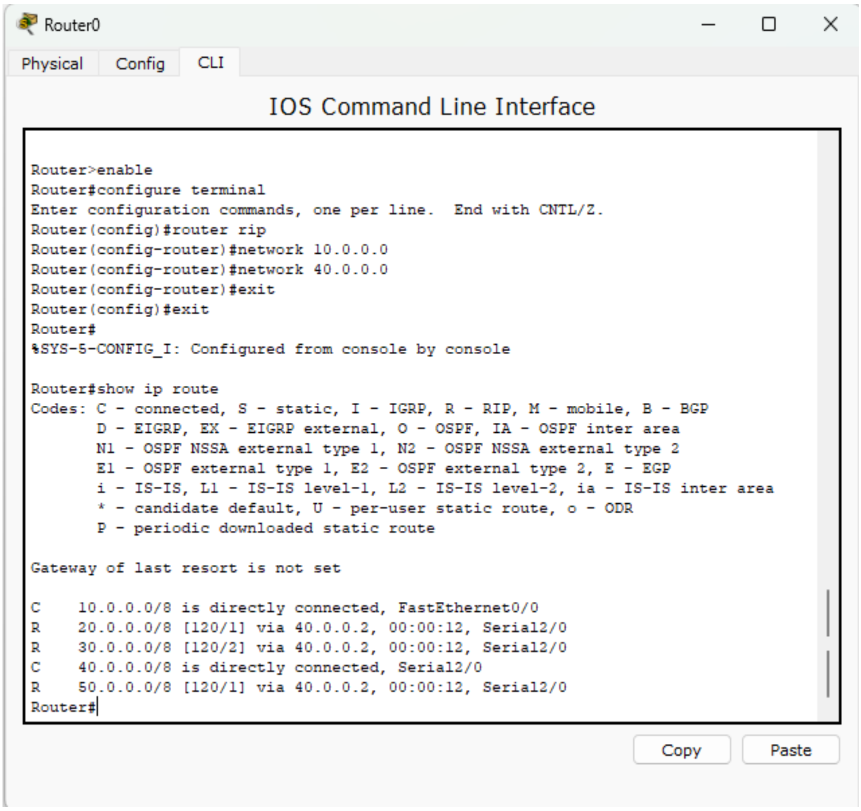
(6) Check if network addresses are assinged by using command in CLI:

```
# show ip route
```

iii. Screen shots/ output

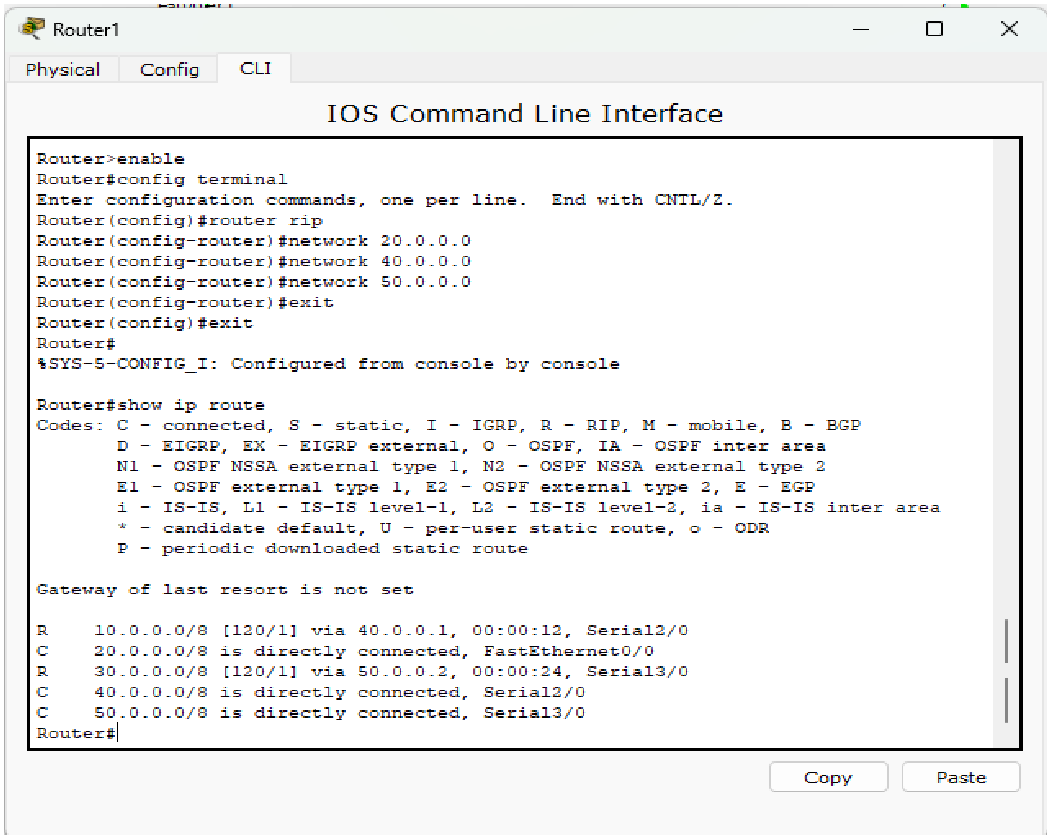


40.0.0.1
Se2/0
Router-PT
Fa0/0
10.0.0.1
40.0.0.2
Se2/0
50.0.0.1
Se3/0
Router-PT
Fa0/0
20.0.0.1
50.0.0.2
Se2/0
Fa0/0
Router2
30.0.0.1
Fa2/1
Fa0/1
Fa1/1
Fa2/1
Fa0/1
Fa1/1
Fa2/1
Fa0/1
Fa1/1
Fa0
Fa0
Fa0
Fa0
Fa0
Fa0
PC-PT
PC0
10.0.0.2
PC-PT
PC1
10.0.0.3
PC-PT
PC2
20.0.0.2
PC-PT
PC3
20.0.0.3
PC-PT
PC4
30.0.0.2
PC-PT
PC5
30.0.0.3

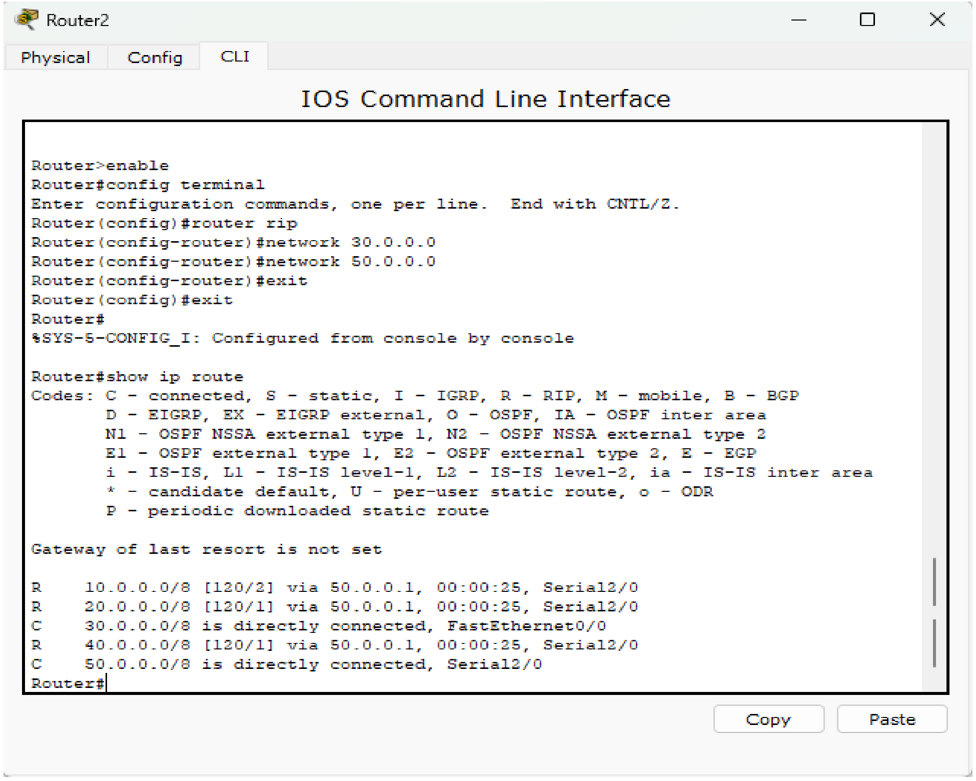


Router0
Physical
Config
CLI
IOS Command Line Interface
Copy
Paste

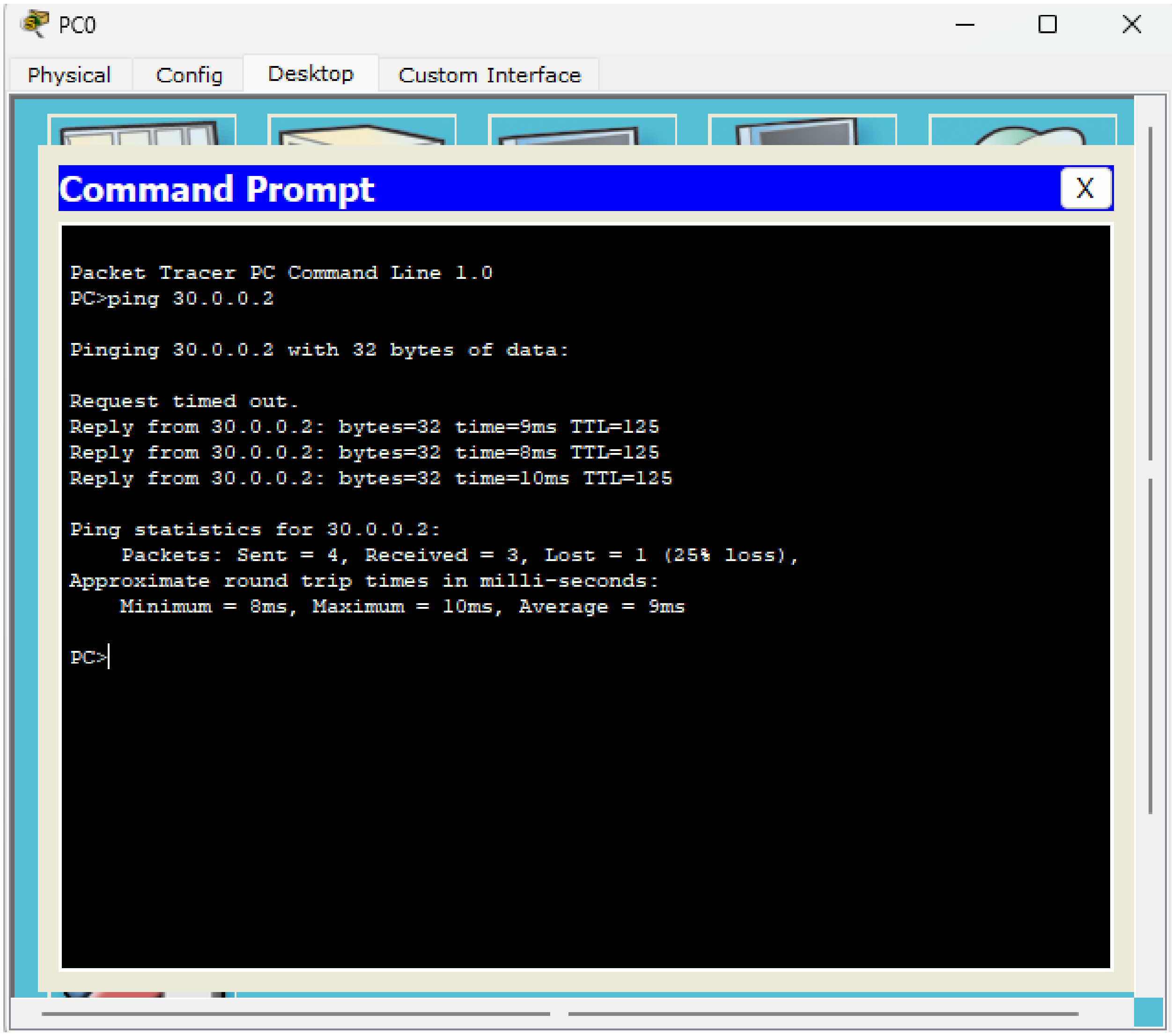
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console 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

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>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 20.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
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, 00:00:12, 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, 00:00:24, 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#
```

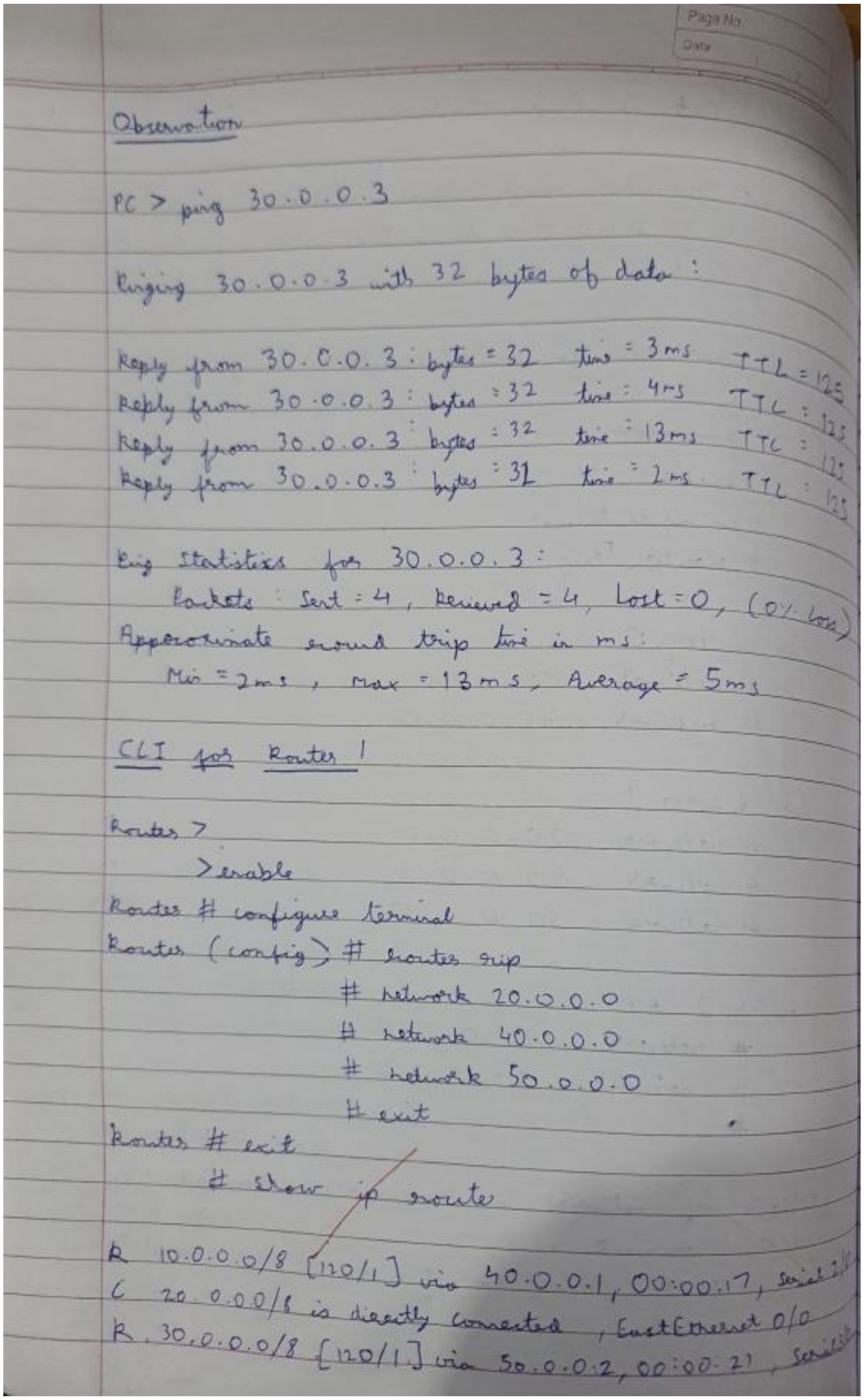


```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console 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 [120/2] via 50.0.0.1, 00:00:25, Serial2/0
R    20.0.0.0/8 [120/1] via 50.0.0.1, 00:00:25, 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, 00:00:25, Serial2/0
C    50.0.0.0/8 is directly connected, Serial2/0
Router#
```


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X

```
Packet Tracer PC Command Line 1.0
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=9ms TTL=125
Reply from 30.0.0.2: bytes=32 time=8ms TTL=125
Reply from 30.0.0.2: bytes=32 time=10ms 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 = 8ms, Maximum = 10ms, Average = 9ms

PC>
```

iv. Observation



Page No.
Date

Observation

```
PC > ping 30.0.0.3

Pinging 30.0.0.3 with 32 bytes of data :

Reply from 30.0.0.3 : bytes = 32   time = 3ms    TTL = 125
Reply from 30.0.0.3 : bytes = 32   time = 4ms    TTL = 125
Reply from 30.0.0.3 : bytes = 32   time = 13ms   TTL = 125
Reply from 30.0.0.3 : bytes = 32   time = 2ms    TTL = 125

Ping statistics for 30.0.0.3 :
    Packets : Sent = 4 , Received = 4, Lost = 0, (0% loss)
Approximate round trip time in ms :
    Min = 2ms ,  Max = 13ms,  Average = 5ms
```

CLI for Router 1

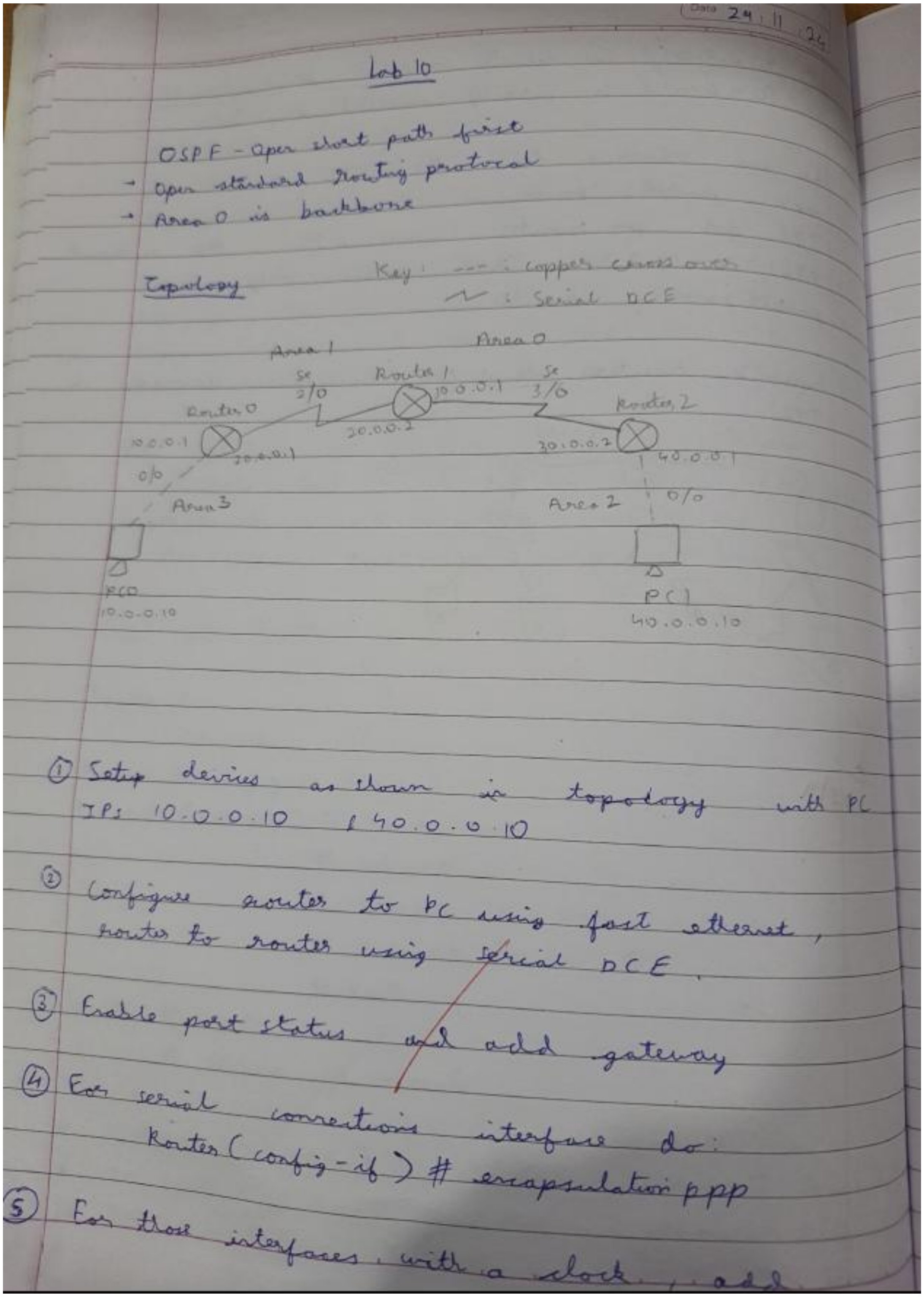
```
Router >
       >enable
Router # configure terminal
Router (config) # router rip
                # network 20.0.0.0
                # network 40.0.0.0
                # network 50.0.0.0
                # exit
Router # exit
       # show ip route

R  10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:17, Serial2/
C  20.0.0.0/8 is directly connected , FastEthernet 0/0
R. 30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:21 , Serial
```

Program 6

i. Aim of the program

Configure OSPF routing protocol

ii. Procedure along with the topology



Date 24 . 11 . 24

Lab 10

OSPF - Open short path first

→ Open standard routing protocol
→ Area 0 is backbone

Topology

Key : --- : copper cross over
: Serial DCE
Area 1
Area 0
Se 2/0
Router 1
10.0.0.1
Se 3/0
Router 0
Router 2
10.0.0.1
20.0.0.1
20.0.0.2
30.0.0.2
40.0.0.1
0/0
Area 3
Area 2
0/0
PC0
10.0.0.10
PC1
40.0.0.10

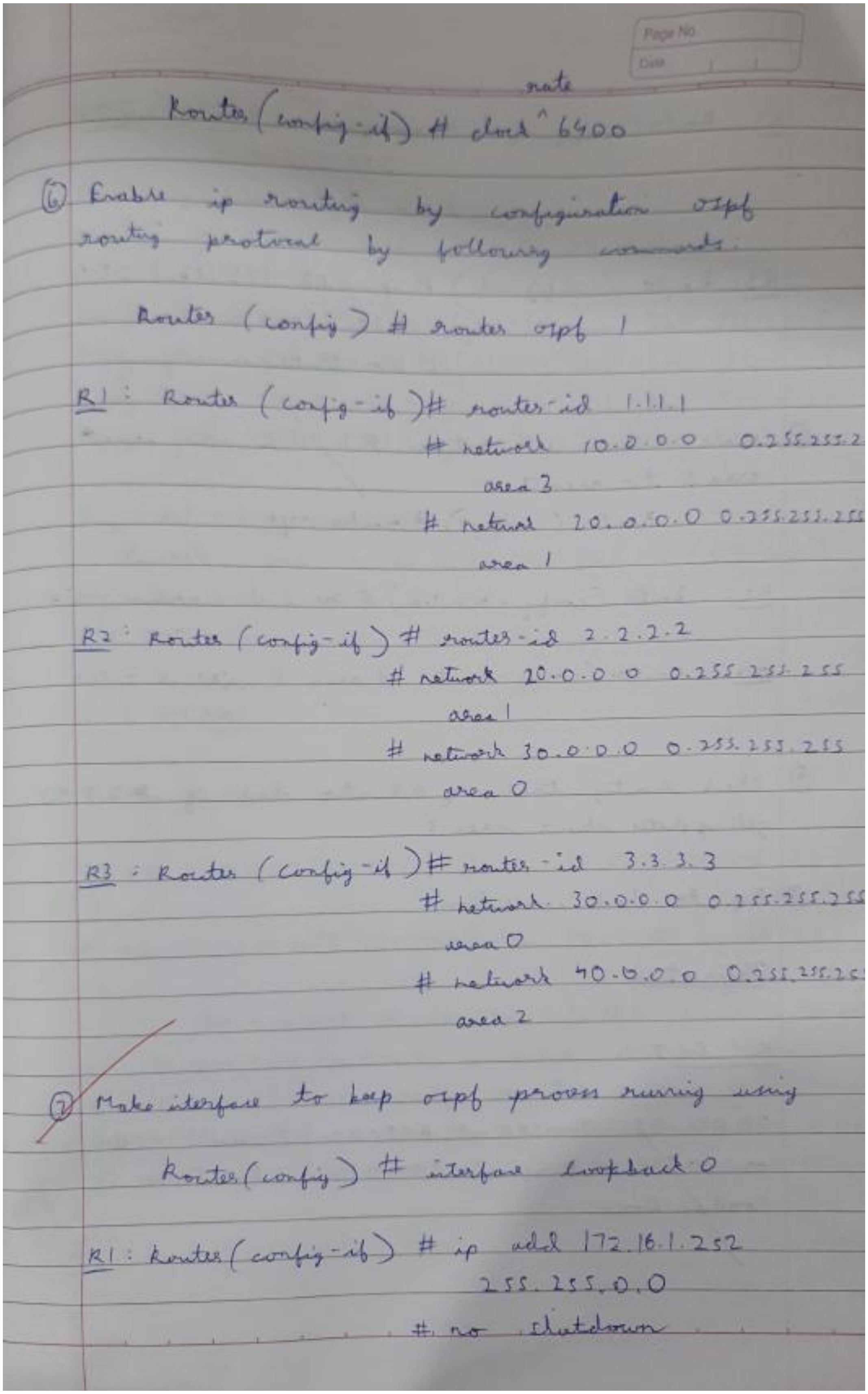
① Setup devices as shown in topology with PC IPs 10.0.0.10 & 40.0.0.10

② Configure router to PC using fast ethernet, router to router using serial DCE.

③ Enable port status and add gateway

④ For serial connections interface do:
Router(config-if)# encapsulation ppp

⑤ For those interfaces, with a clock, add



```
Router (config-if) # clock rate 6400
```

⑥ Enable ip routing by configuration ospf routing protocol by following commands.

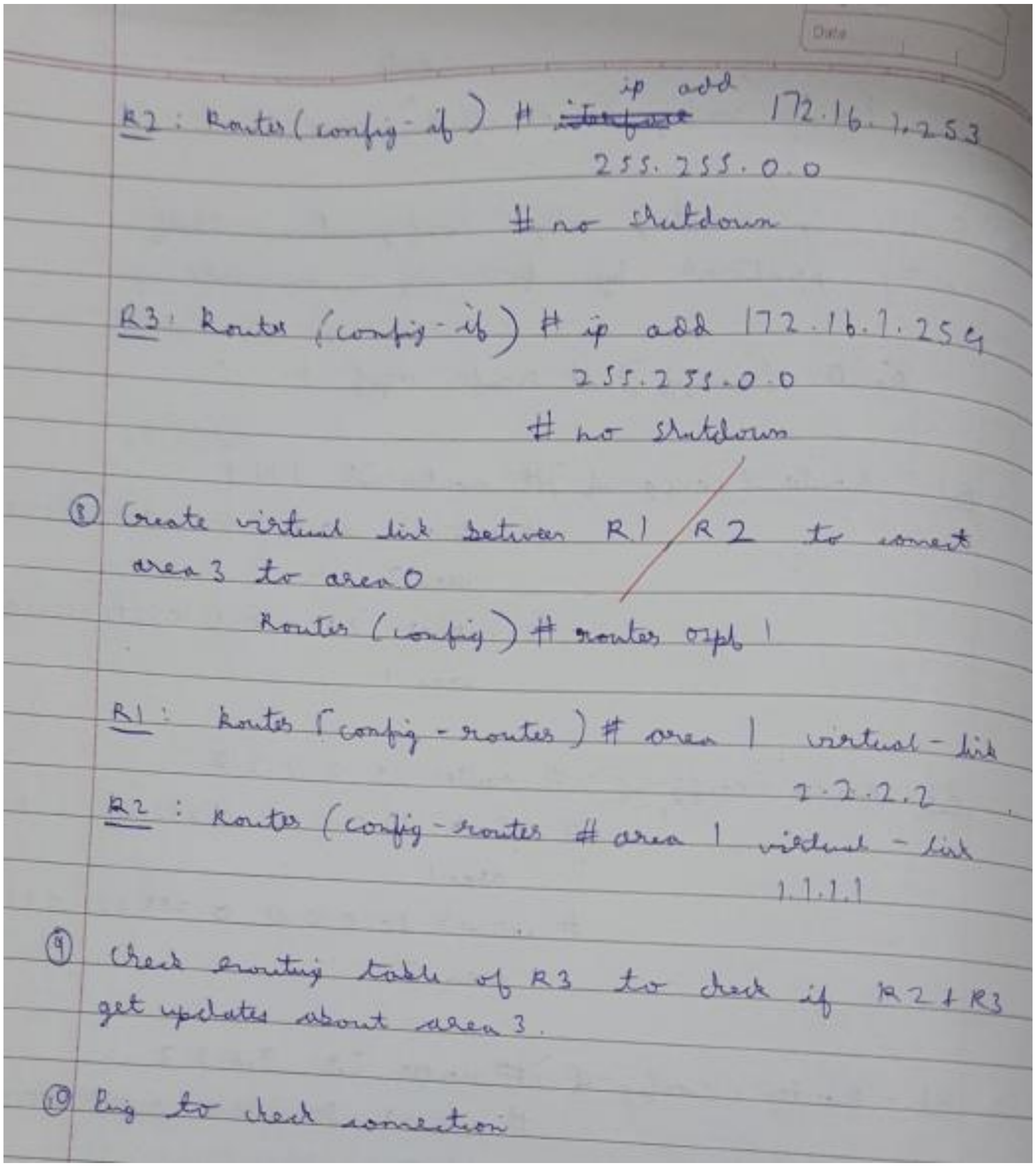
```
Router (config) # router ospf 1
```

```
R1 : Router (config-if)# router-id 1.1.1.1
                        # network 10.0.0.0 0.255.255.2
                          area 3
                        # network 20.0.0.0 0.255.255.255
                          area 1

R2 : Router (config-if) # 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

R3 : Router (config-if )# router-id 3.3.3.3
                        # network 30.0.0.0 0.255.255.255
                          area 0
                        # network 40.0.0.0 0.255.255.25
                          area 2
```

⑦ Make interface to keep ospf process running using

```
Router(config) # interface loopback 0
```

```
R1 : Router(config-if) # ip add 172.16.1.252
                          255.255.0.0
                       # no shutdown
```



R2 : Router(config-if) # ~~interface~~ ip add 172.16.1.253
255.255.0.0
# no shutdown

R3: Router (config-if) # ip add 172.16.1.254
255.255.0.0
# no shutdown

⑧ Create virtual link between R1 R2 to connect area 3 to area 0

Router (config) # router ospf 1

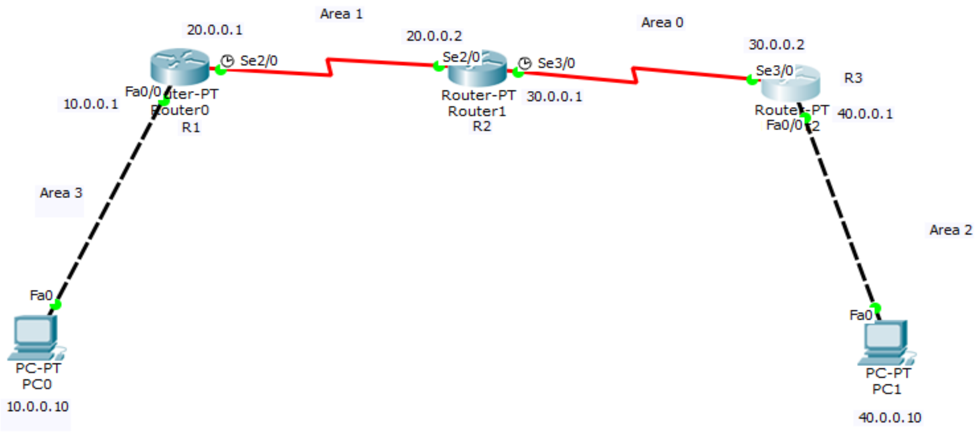
R1: Router (config-router) # area 1 virtual-link 2.2.2.2

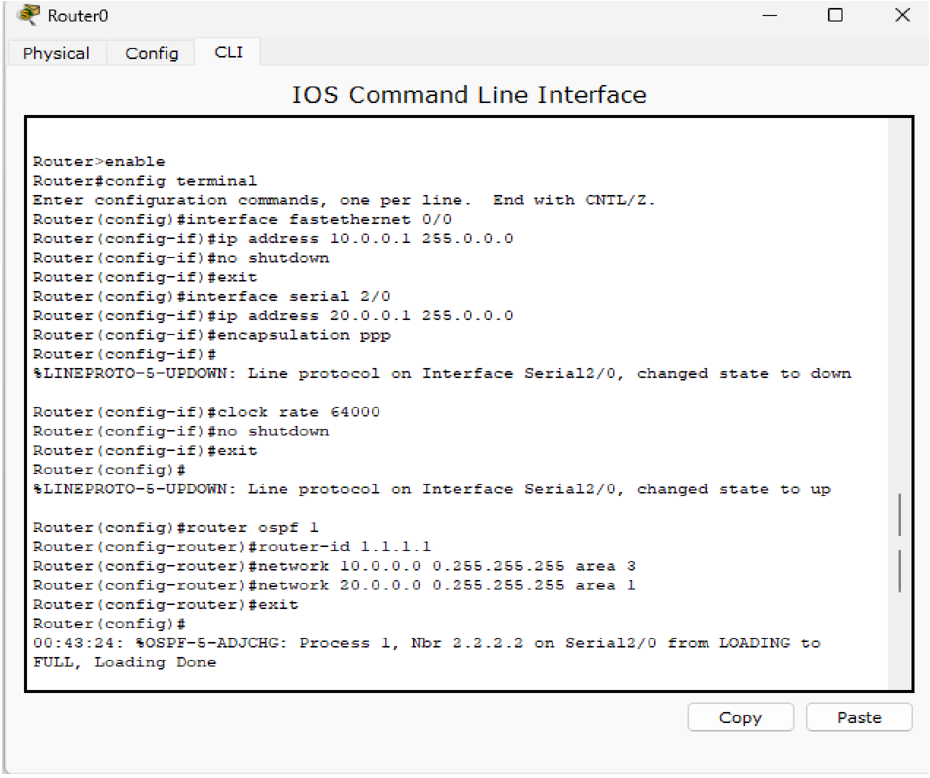
R2 : Router (config-router # area 1 virtual-link 1.1.1.1

⑨ Check routing table of R3 to check if R2 + R3 get updates about area 3.

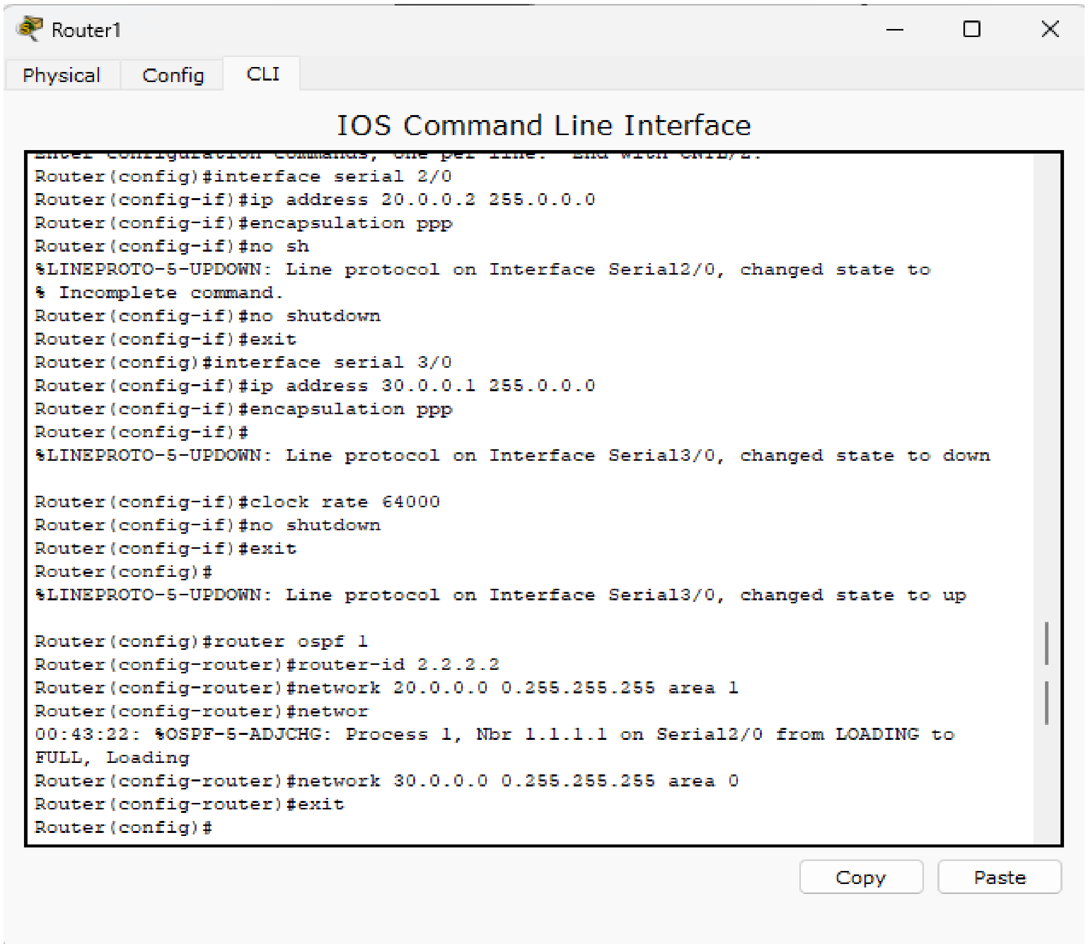
⑩ Ping to check connection

iii. Screen shots/ output

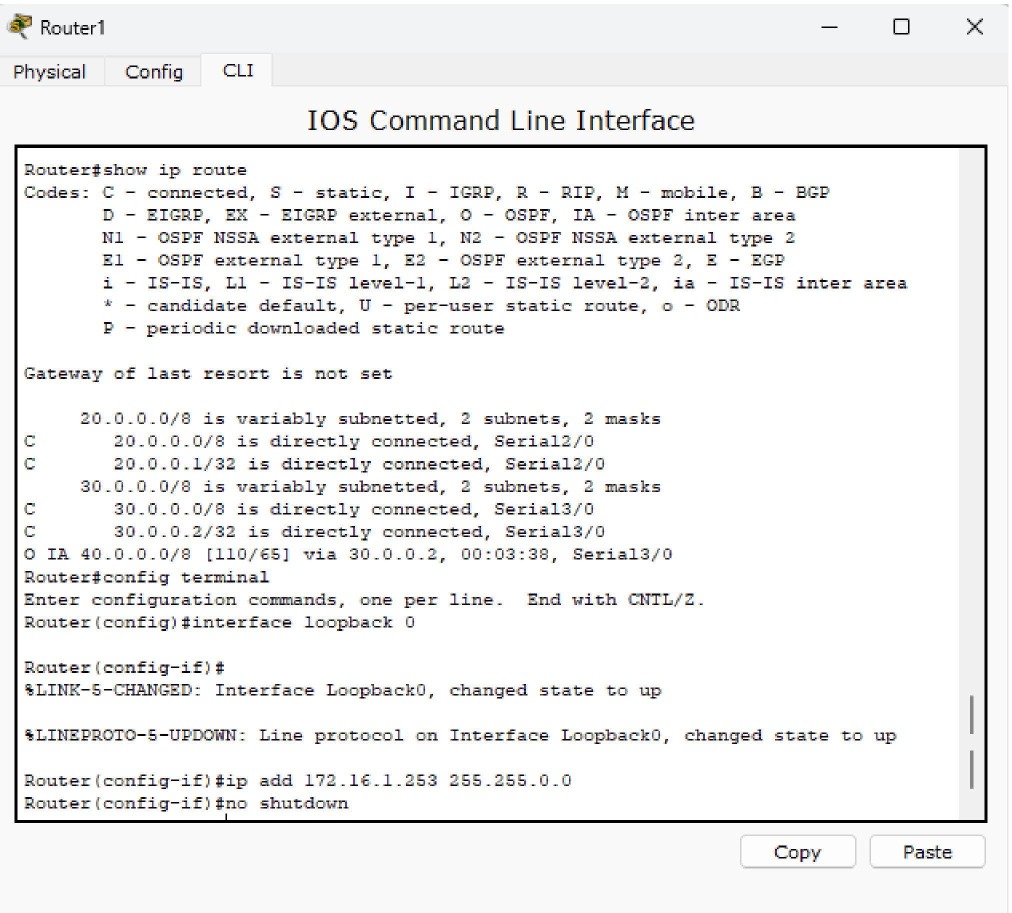

Area 1
Area 0
20.0.0.1
Se2/0
Fa0/0
10.0.0.1
Router-PT
Router0
R1
20.0.0.2
Se2/0
Se3/0
Router-PT
Router1
R2
30.0.0.1
30.0.0.2
Se3/0
R3
Router-PT
Fa0/0
40.0.0.1
Area 3
Area 2
Fa0
PC-PT
PC0
10.0.0.10
Fa0
PC-PT
PC1
40.0.0.10


Router0
Physical
Config
CLI
IOS Command Line Interface
Copy
Paste

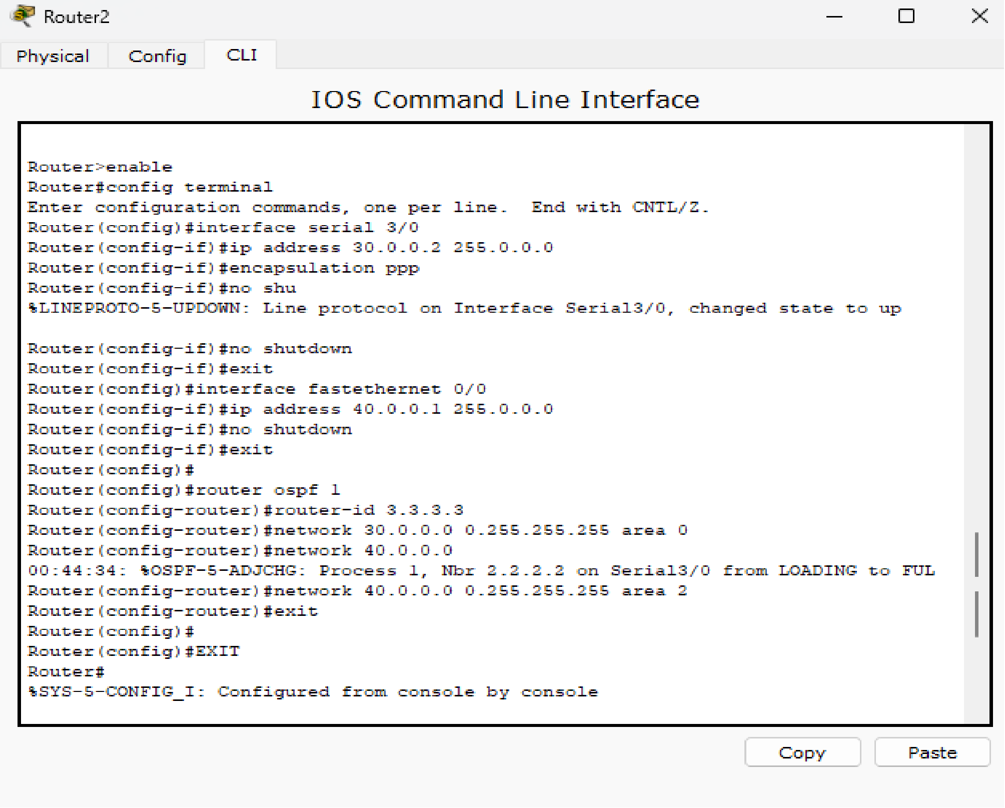
```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
00:43:24: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to
FULL, Loading Done
```



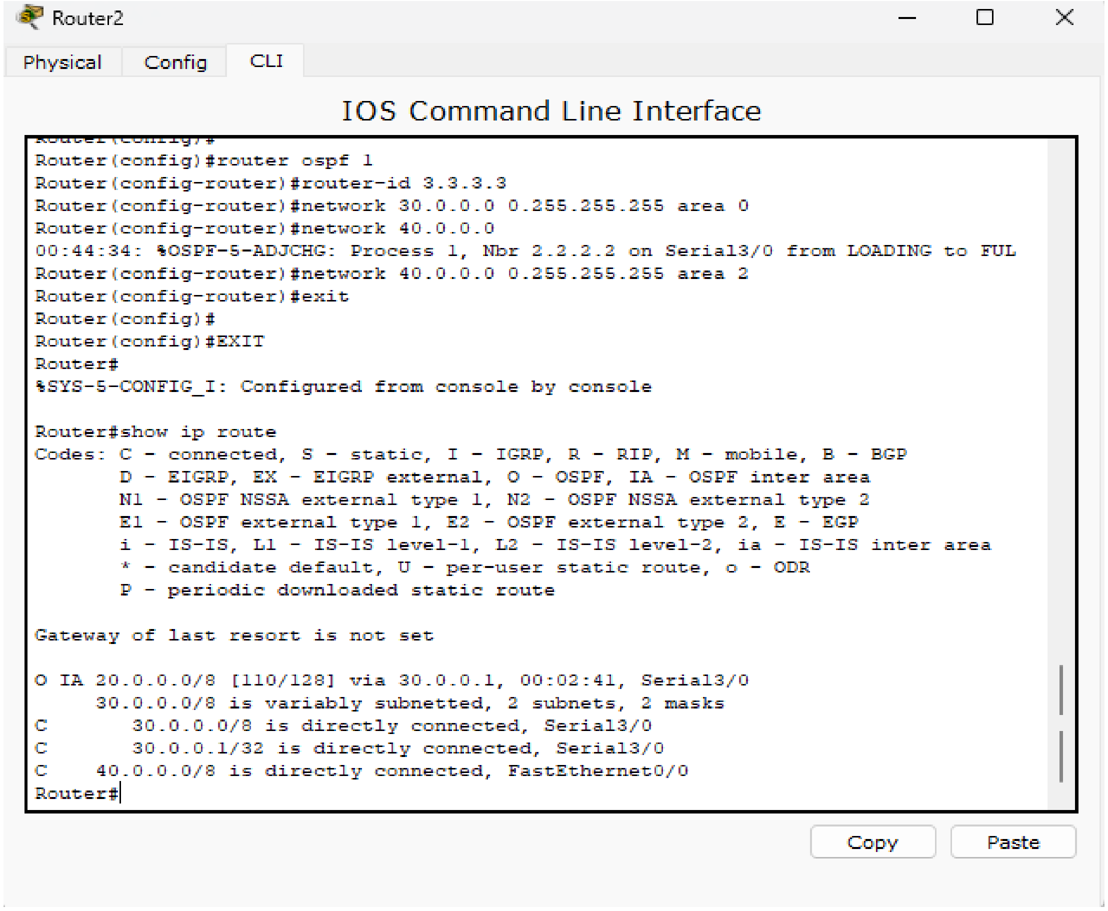
```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no sh
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to
% Incomplete command.
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down

Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#networ
00:43:22: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to
FULL, Loading
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
```



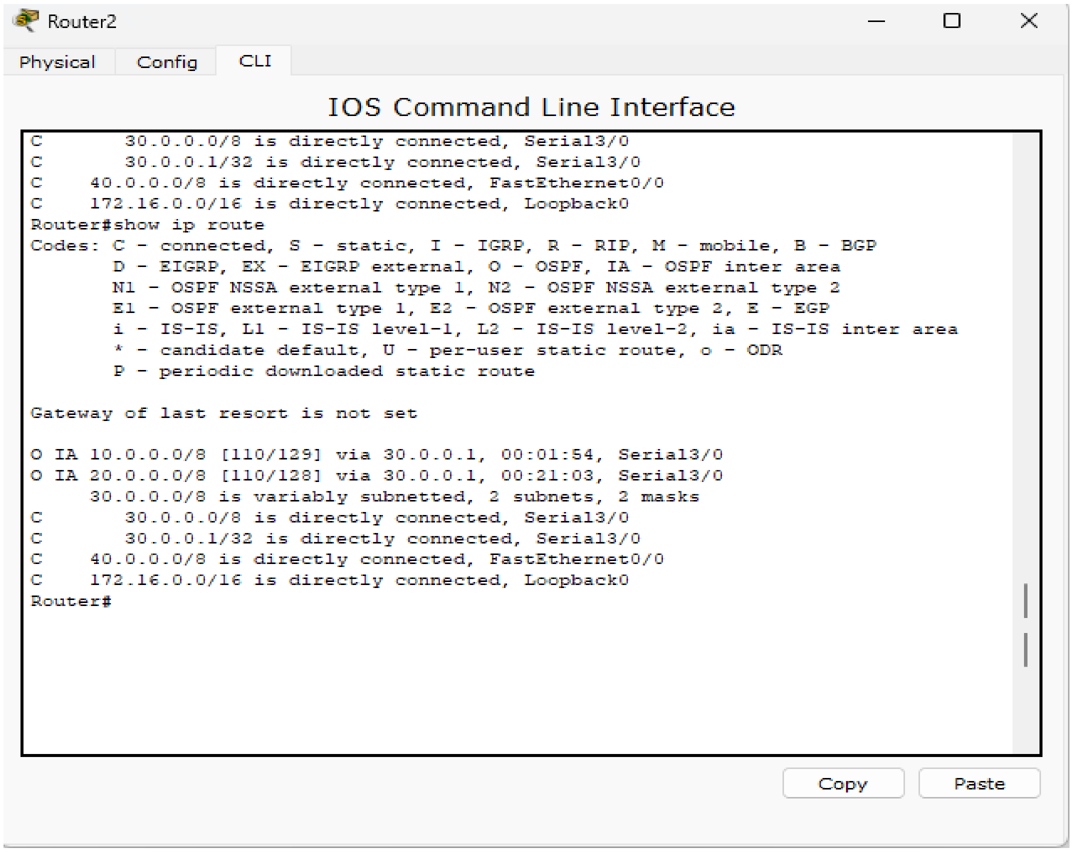
```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E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

     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 IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:03:38, Serial3/0
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip add 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
```



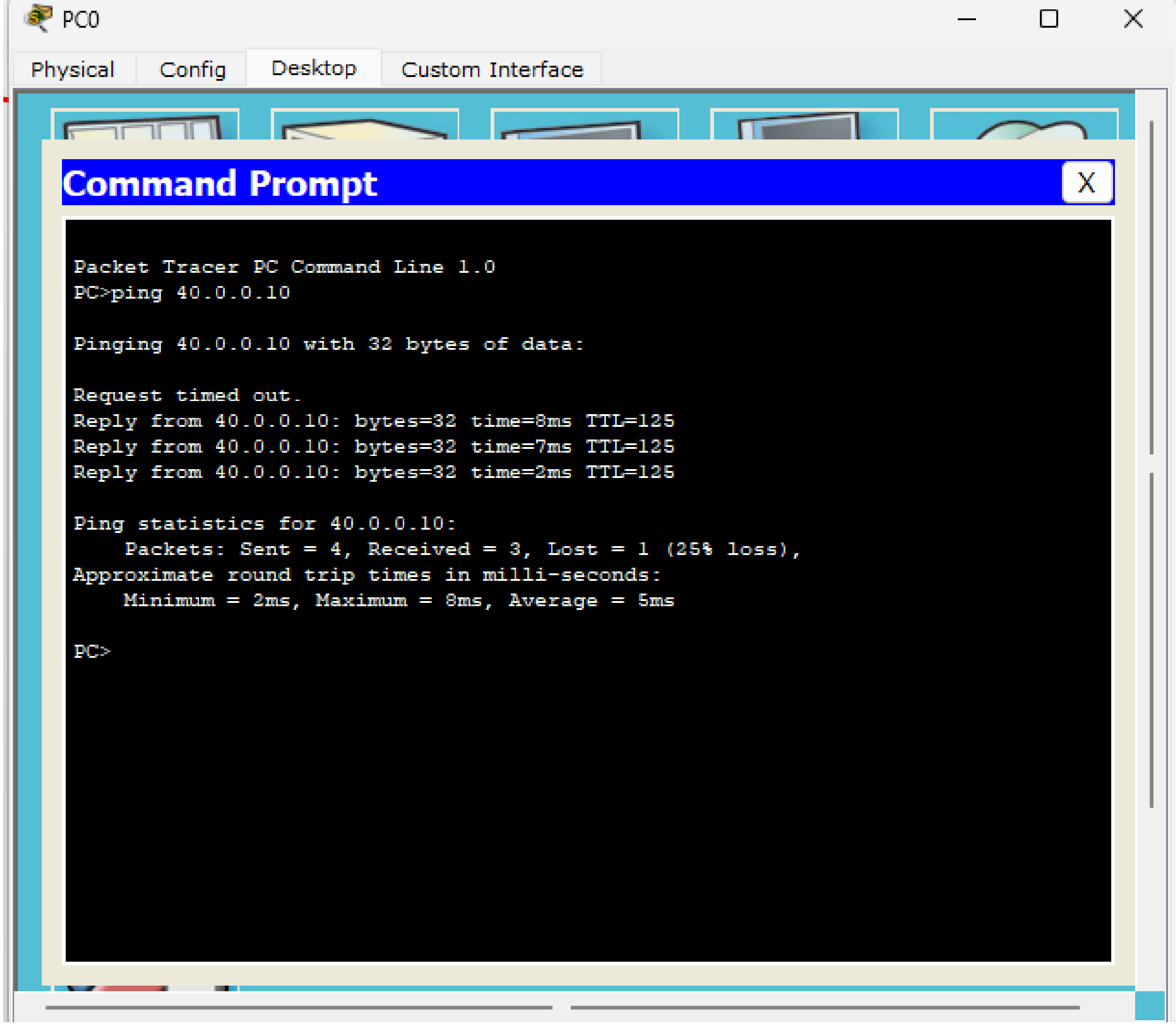
```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shu
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#network 40.0.0.0
00:44:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FUL
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
Router(config)#EXIT
Router#
%SYS-5-CONFIG_I: Configured from console by console
```



```
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#network 40.0.0.0
00:44:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FUL
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
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

O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:02:41, Serial3/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```



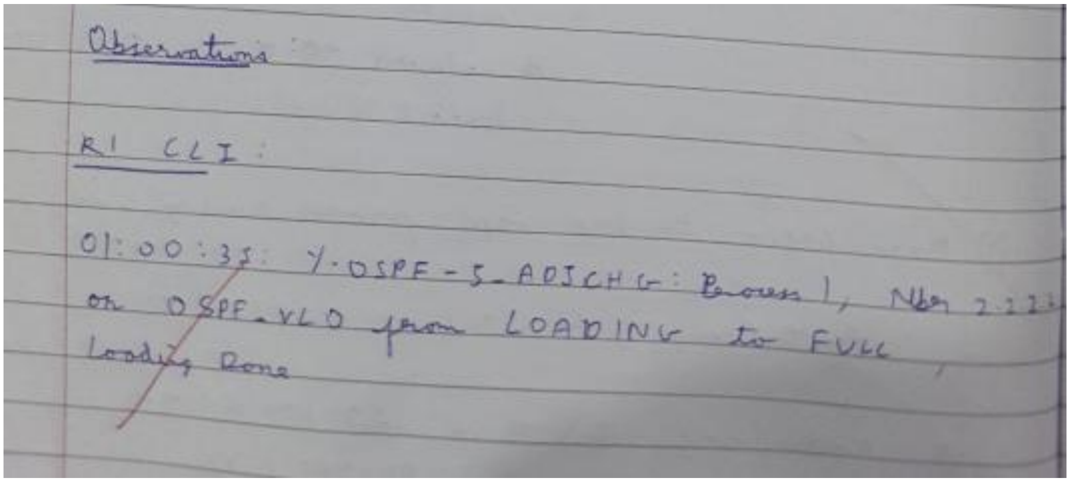
```
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, 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, 00:01:54, Serial3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:21:03, Serial3/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#
```



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:

Request timed out.
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=2ms 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 = 2ms, Maximum = 8ms, Average = 5ms

PC>
```

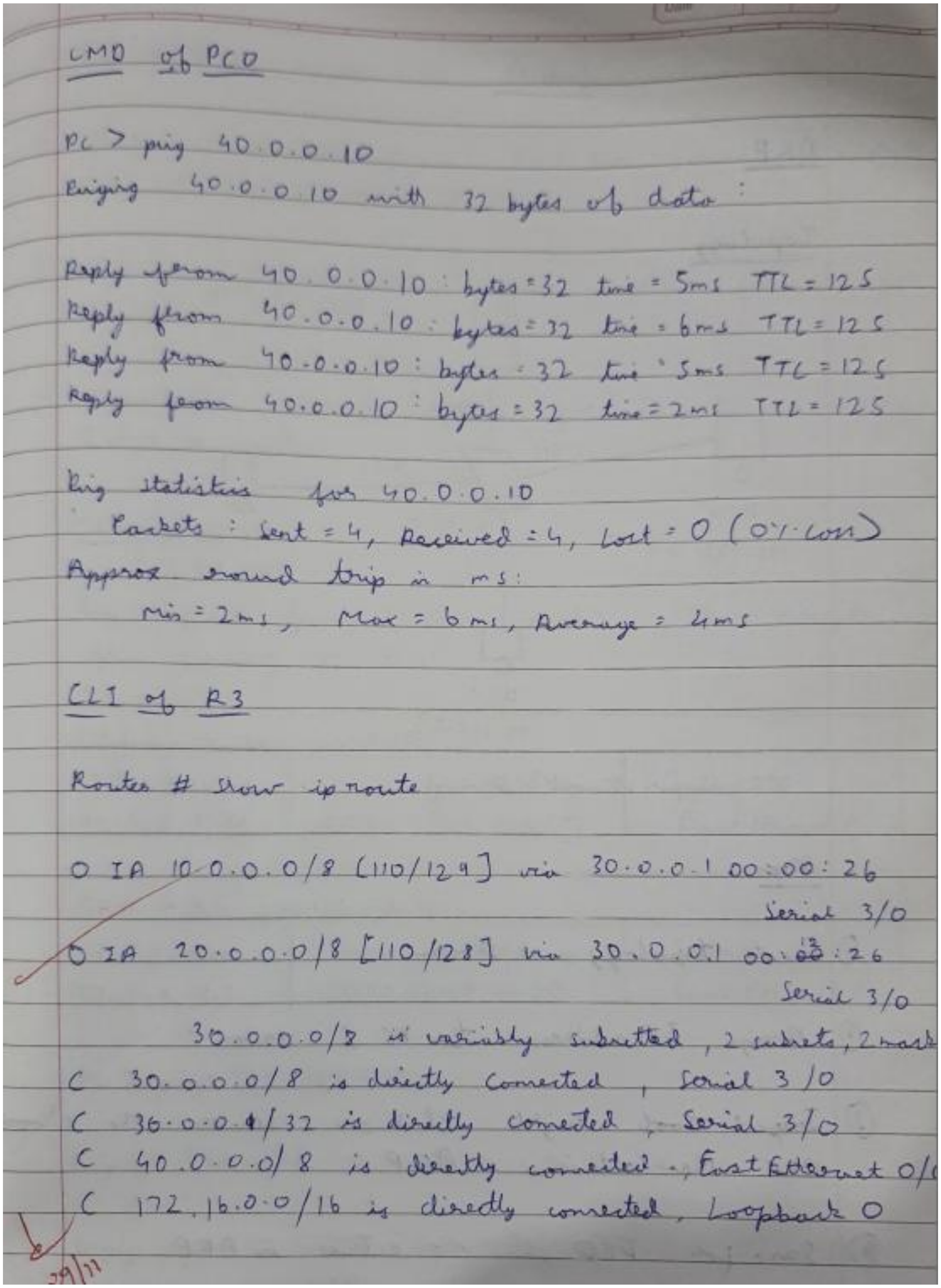
iv. Observation



Observations

R1 CLI:

```
01:00:35: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2
on OSPF_VL0 from LOADING to FULL,
Loading Done
```



CMD of PC0

```
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 = 5ms 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
Reply from 40.0.0.10 : bytes = 32 time=2ms TTL = 125

Ping statistics for 40.0.0.10
  Packets : Sent = 4, Received = 4, Lost = 0 (0% loss)
Approx round trip in ms:
    Min = 2ms, Max = 6ms, Average = 4ms
```

CLI of R3

```
Router # show ip route

O IA 10.0.0.0/8 [110/129] via 30.0.0.1 00:00:26
                                         Serial 3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1 00:13:26
                                         Serial 3/0
        30.0.0.0/8 is variably subnetted, 2 subnets, 2 mask
C  30.0.0.0/8 is directly connected , Serial 3/0
C  30.0.0.1/32 is directly connected , Serial 3/0
C  40.0.0.0/8 is directly connected , FastEthernet 0/
C  172.16.0.0/16 is directly connected, Loopback 0
```

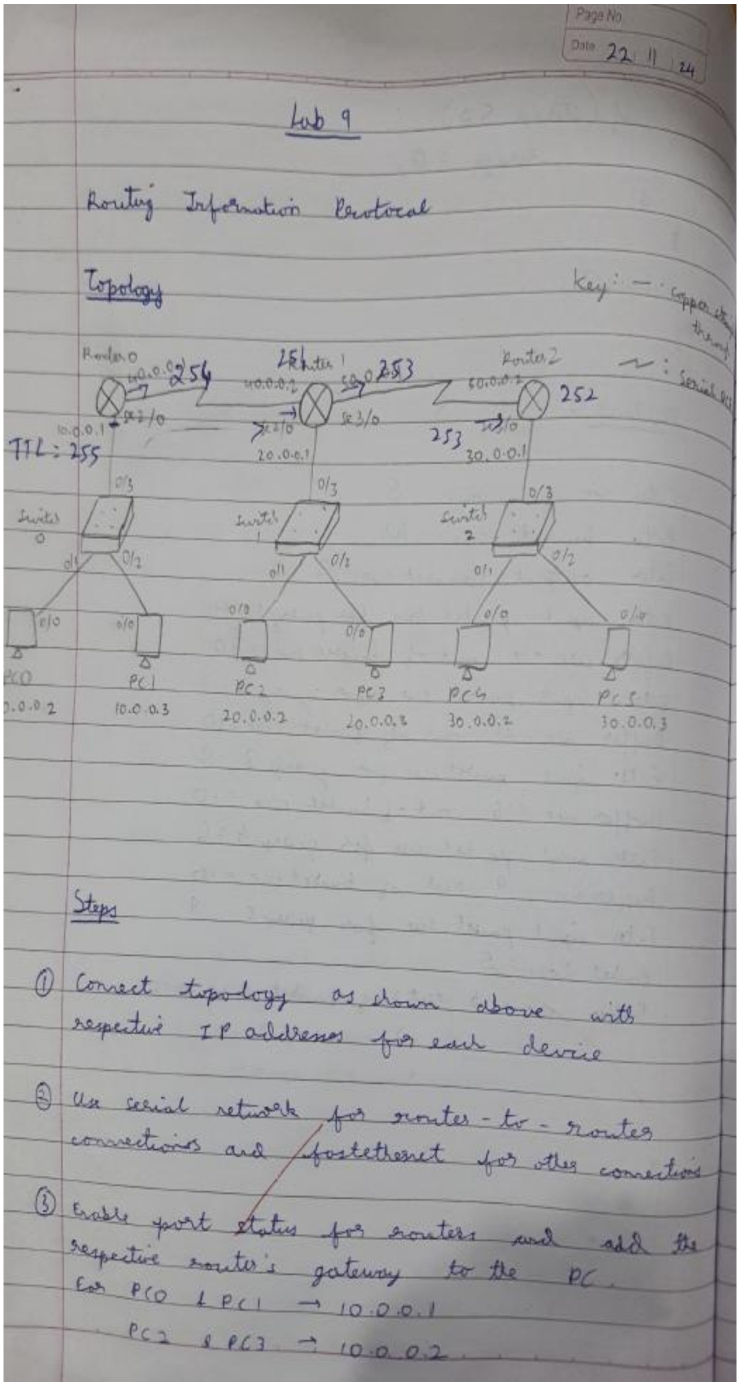
29/11

Program 7

i. Aim of the program

Demonstrate the TTL/ Life of a Packet

ii. Procedure along with the topology



Page No

Date 22 11 24

Lab 9

Routing Information Protocal

Topology

Key: — : copper straight through
⌁ : Serial DCE
Router0
40.0.0.1
254
Se2/0
10.0.0.1
TTL: 255
Router1
255
40.0.0.2
Se2/0
Se3/0
50.0.0.1
253
20.0.0.1
Router2
50.0.0.2
252
Se2/0
253
30.0.0.1
0/3
0/3
0/3
Switch 0
Switch 1
Switch 2
0/1
0/2
0/1
0/2
0/1
0/2
0/0
0/0
0/0
0/0
0/0
0/0
PC0
10.0.0.2
PC1
10.0.0.3
PC2
20.0.0.2
PC3
20.0.0.3
PC4
30.0.0.2
PC5
30.0.0.3

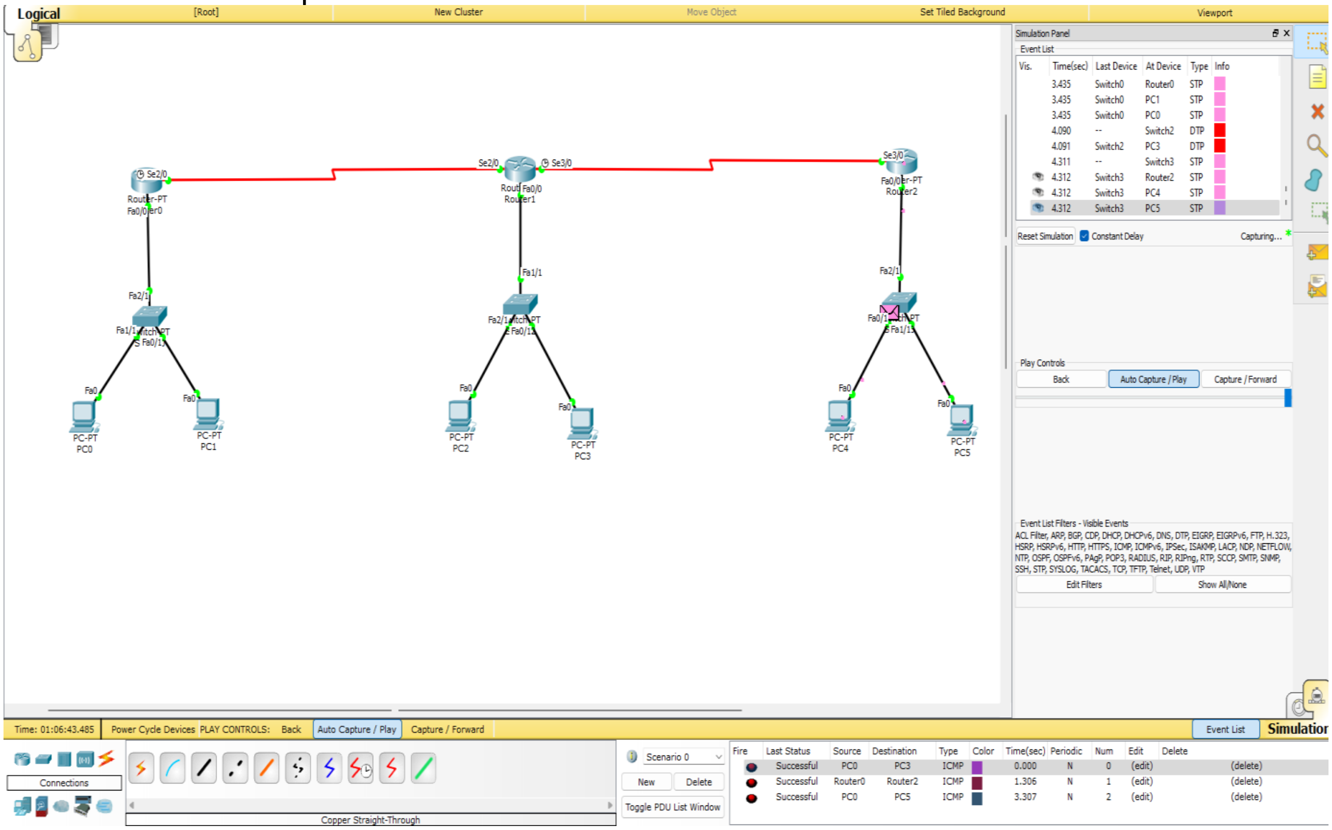
Steps

① Connect topology as shown above with respective IP addresses for each device

② Use serial network for router-to-router connections and fastethernet for other connections

③ Enable port status for routers and add the respective router's gateway to the PC.
For PC0 & PC1 → 10.0.0.1
PC2 & PC3 → 10.0.0.2

iii. Screen shots/ output


Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Se2/0
Router-PT
Router0
Fa0/0
Se2/0
Se3/0
Fa0/0
Router1
Se3/0
Fa0/0
Router-PT
Router2
Fa2/1
Fa1/1
Switch-PT
Fa0/1
Fa1/1
Fa2/1
Fa0/1
Fa2/1
Fa0/1
Fa1/1
Fa0
PC-PT
PC0
PC1
PC2
PC3
PC4
PC5
Simulation Panel
Event List
Reset Simulation
Constant Delay
Capturing...
Play Controls
Back
Auto Capture / Play
Capture / Forward
Event List Filters - Visible Events
Edit Filters
Show All/None
Time: 01:06:43.485
Power Cycle Devices
PLAY CONTROLS:
Connections
Copper Straight-Through
Scenario 0
New
Delete
Toggle PDU List Window
Event List
Simulation

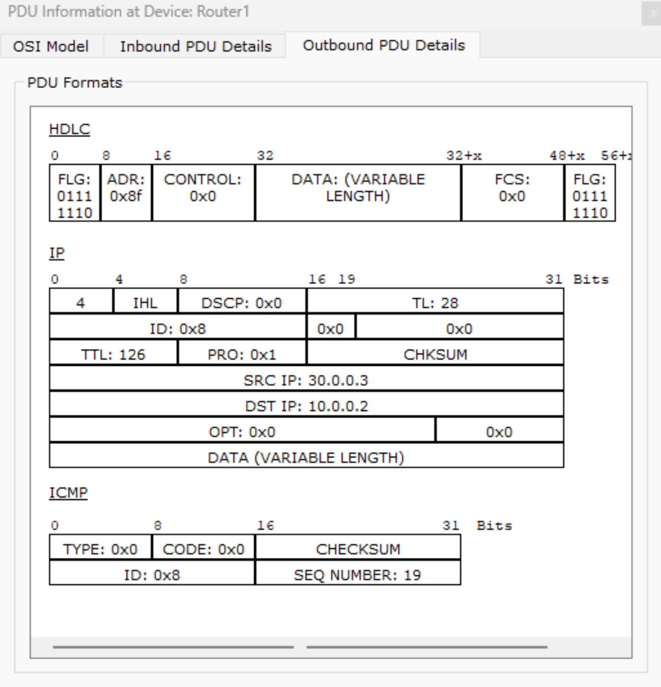
Vis.	Time(sec)	Last Device	At Device	Type	Info
	3.435	Switch0	Router0	STP	🟪
	3.435	Switch0	PC1	STP	🟪
	3.435	Switch0	PC0	STP	🟪
	4.090	--	Switch2	DTP	🟥
	4.091	Switch2	PC3	DTP	🟥
	4.311	--	Switch3	STP	🟪
	4.312	Switch3	Router2	STP	🟪
	4.312	Switch3	PC4	STP	🟪
	4.312	Switch3	PC5	STP	🟪

☑ Constant Delay

Event List Filters - Visible Events: ACL Filter, ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

Time: 01:06:43.485

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC0	PC3	ICMP	🟪	0.000	N	0	(edit)	(delete)
●	Successful	Router0	Router2	ICMP	🟥	1.306	N	1	(edit)	(delete)
●	Successful	PC0	PC5	ICMP	🟦	3.307	N	2	(edit)	(delete)



PDU Information at Device: Router1

OSI Model
Inbound PDU Details
Outbound PDU Details

PDU Formats

HDLC

0 8 16 32 32+x 48+x 56+

FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110

IP

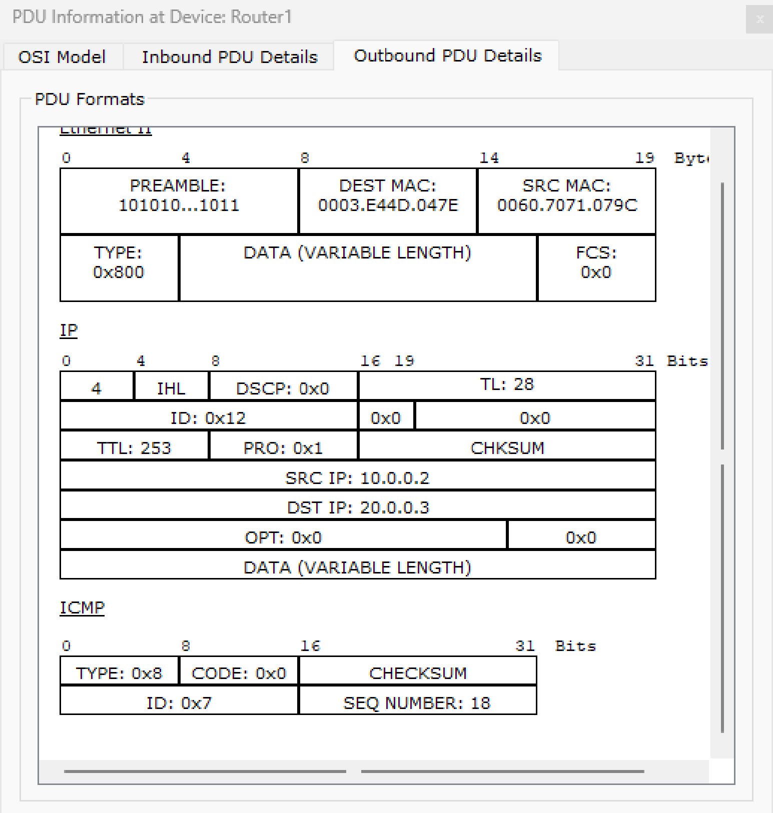
0 4 8 16 19 31 Bits

4	IHL	DSCP: 0x0	TL: 28
ID: 0x8		0x0	0x0
TTL: 126		PRO: 0x1	CHKSUM
SRC IP: 30.0.0.3			
DST IP: 10.0.0.2			
OPT: 0x0			0x0
DATA (VARIABLE LENGTH)			

ICMP

0 8 16 31 Bits

TYPE: 0x0	CODE: 0x0	CHECKSUM
ID: 0x8		SEQ NUMBER: 19



PDU Information at Device: Router1

OSI Model
Inbound PDU Details
Outbound PDU Details

PDU Formats

Ethernet II

0 4 8 14 19 Byt

PREAMBLE: 101010...1011	DEST MAC: 0003.E44D.047E	SRC MAC: 0060.7071.079C
TYPE: 0x800	DATA (VARIABLE LENGTH)	FCS: 0x0

IP

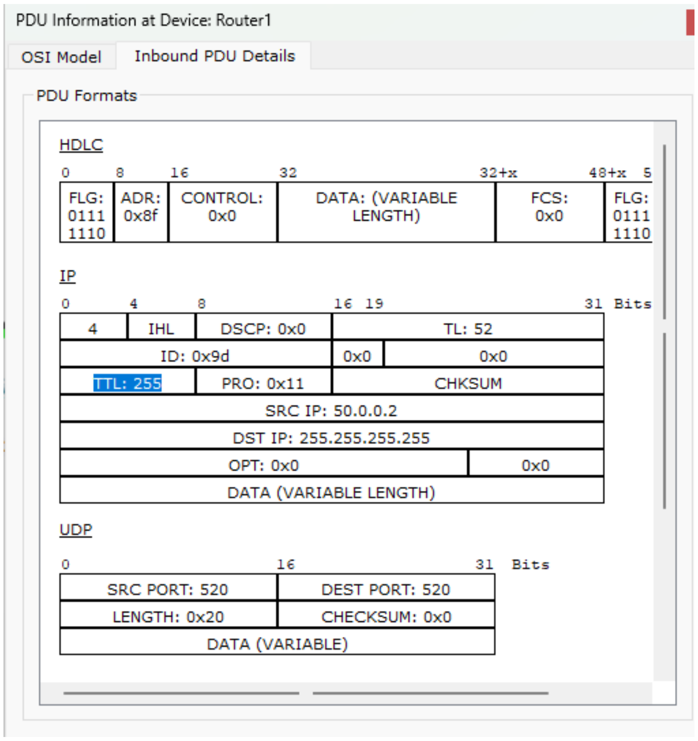
0 4 8 16 19 31 Bits

4	IHL	DSCP: 0x0	TL: 28
ID: 0x12		0x0	0x0
TTL: 253		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: 0x7		SEQ NUMBER: 18


PDU Information at Device: Router1
OSI Model
Inbound PDU Details

PDU Formats

HDLC

0 8 16 32 32+x 48+x 5

FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110

IP

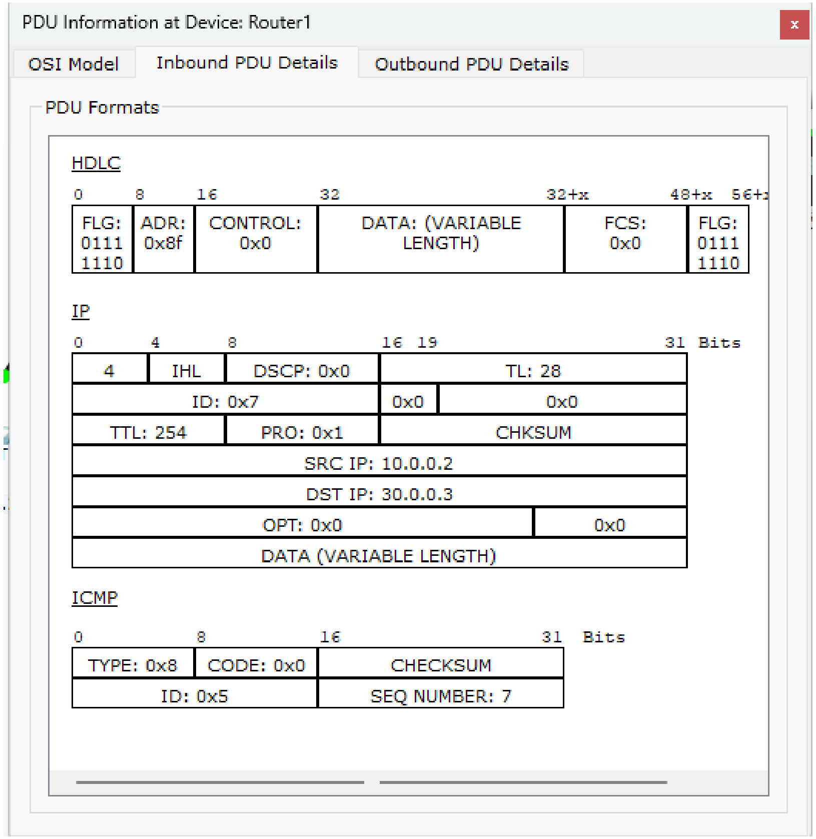
0 4 8 16 19 31 Bits

4 | IHL | DSCP: 0x0 | TL: 52
ID: 0x9d | 0x0 | 0x0
TTL: 255 | PRO: 0x11 | CHKSUM
SRC IP: 50.0.0.2
DST IP: 255.255.255.255
OPT: 0x0 | 0x0
DATA (VARIABLE LENGTH)

UDP

0 16 31 Bits

SRC PORT: 520 | DEST PORT: 520
LENGTH: 0x20 | CHECKSUM: 0x0
DATA (VARIABLE)


PDU Information at Device: Router1
x
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

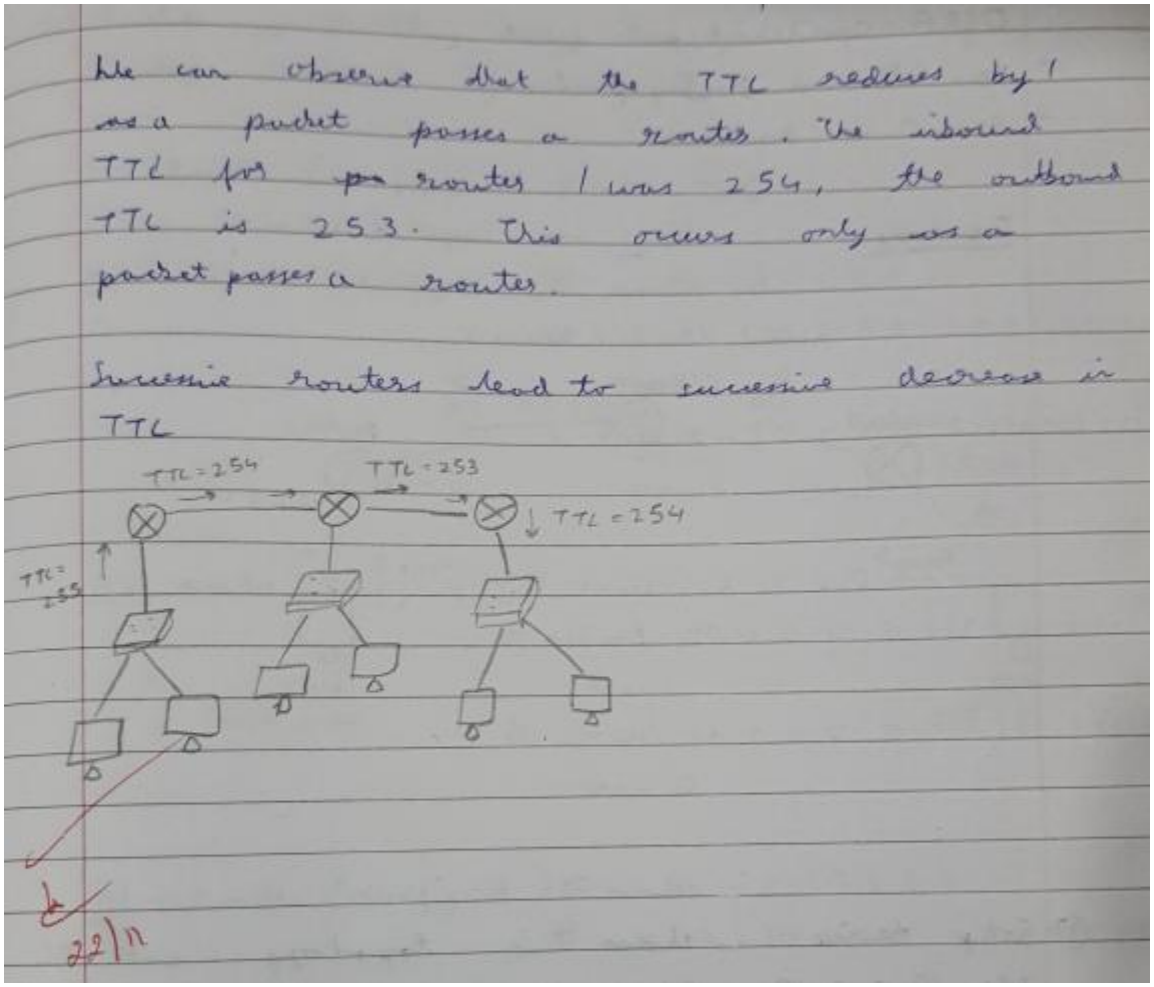
4 | IHL | DSCP: 0x0 | TL: 28
ID: 0x7 | 0x0 | 0x0
TTL: 254 | PRO: 0x1 | CHKSUM
SRC IP: 10.0.0.2
DST IP: 30.0.0.3
OPT: 0x0 | 0x0
DATA (VARIABLE LENGTH)

ICMP

0 8 16 31 Bits

TYPE: 0x8 | CODE: 0x0 | CHECKSUM
ID: 0x5 | SEQ NUMBER: 7

iv. Observation



We can observe that the TTL reduces by 1 as a packet passes a router. The inbound TTL for ~~pa~~ router 1 was 254, the outbound TTL is 253. This occurs only as a packet passes a router.

Successive routers lead to successive decrease in TTL

TTL = 254
TTL = 253
TTL = 254
TTL = 255

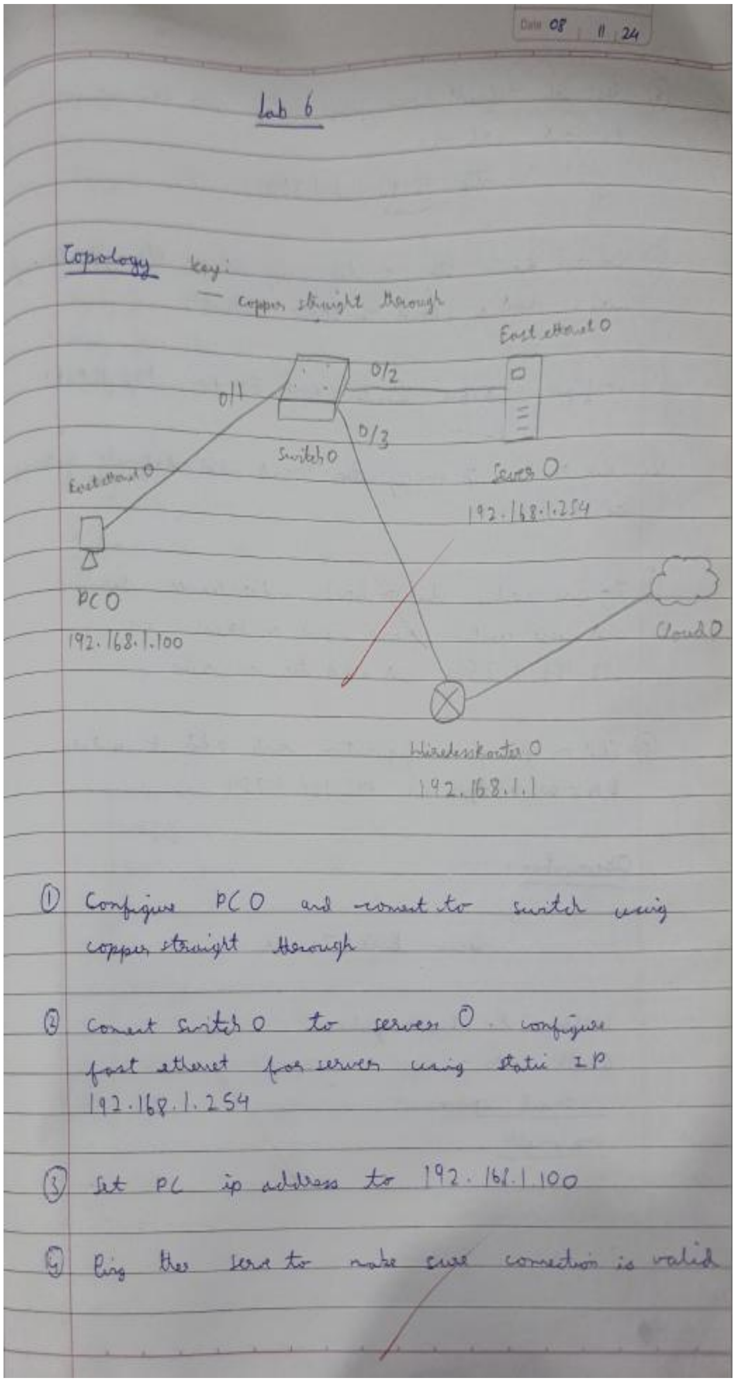
22/11

Program 8

i. Aim of the program

Configure Web Server, DNS within a LAN.

ii. Procedure along with the topology



Date 08 | 11 | 24

Lab 6

Topology key:

— copper straight through

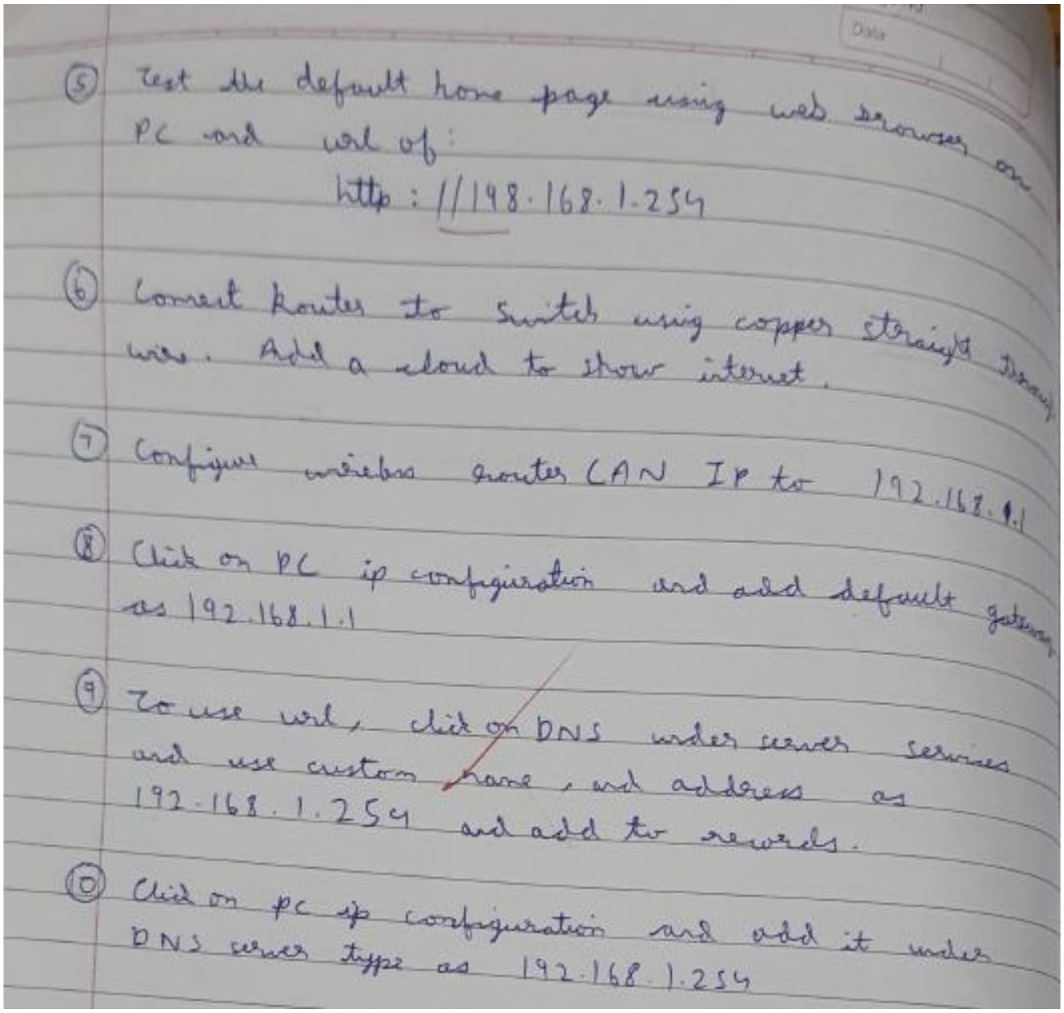
Fast ethernet 0
0/2
0/1
0/3
Switch0
Fast ethernet 0
Server 0
192.168.1.254
PC0
192.168.1.100
Cloud0
WirelessRouter 0
192.168.1.1

① Configure PC0 and connect to switch using copper straight through

② Conect switch 0 to server 0. configure fast ethernet for server using static IP 192.168.1.254

③ Set PC ip address to 192.168.1.100

④ Ping the serve to make sure connection is valid



⑤ Test the default home page using web browser on PC and url of:

http://198.168.1.254

⑥ Connect Router to Switch using copper straight through wire. Add a cloud to show internet.

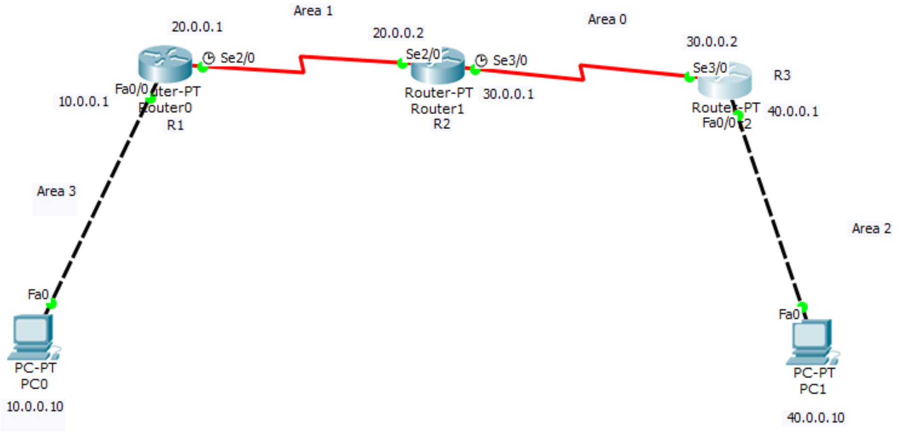
⑦ Configure wireless router LAN IP to 192.168.1.1

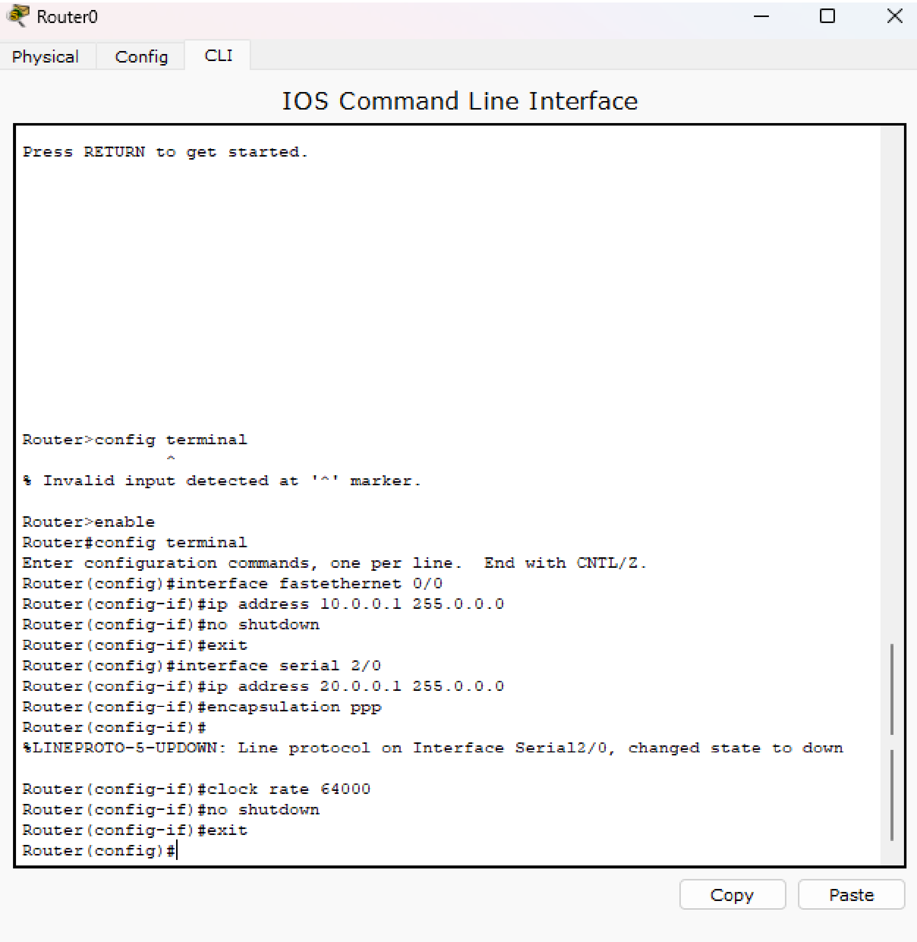
⑧ Click on PC ip configuration and add default gateway as 192.168.1.1

⑨ To use url, click on DNS under server services and use custom name, and address as 192.168.1.254 and add to records.

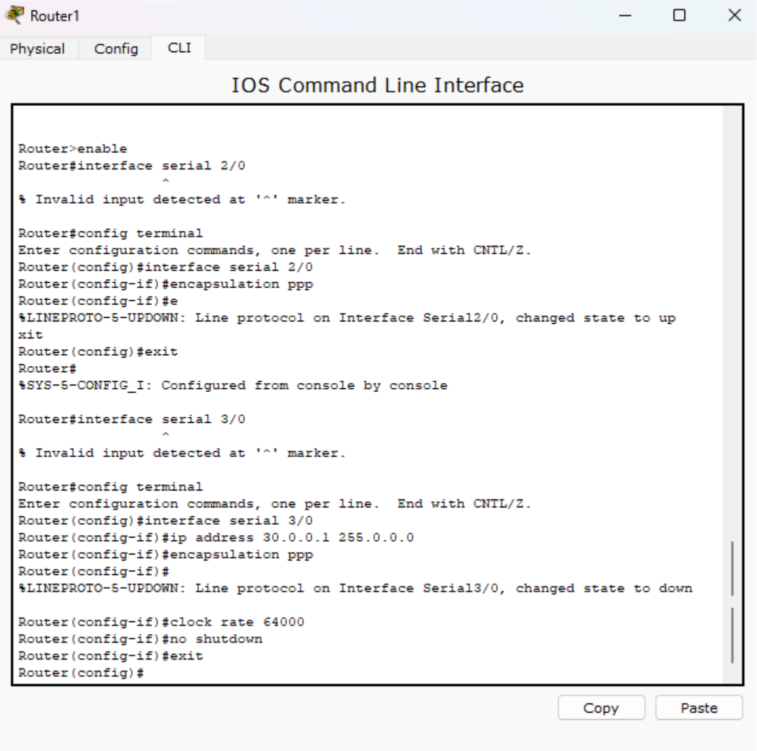
⑩ Click on pc ip configuration and add it under DNS server type as 192.168.1.254

iii. Screen shots/ output

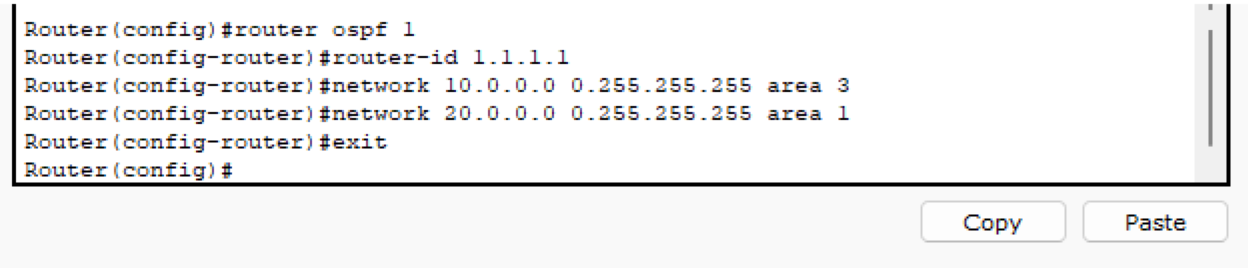

Area 1
Area 0
20.0.0.1
20.0.0.2
30.0.0.2
Se2/0
Se2/0
Se3/0
Se3/0
R3
Fa0/0
10.0.0.1
Router-PT
Router0
R1
Router-PT
Router1
R2
30.0.0.1
Router-PT
Fa0/0
R2
40.0.0.1
Area 3
Area 2
Fa0
Fa0
PC-PT
PC0
10.0.0.10
PC-PT
PC1
40.0.0.10



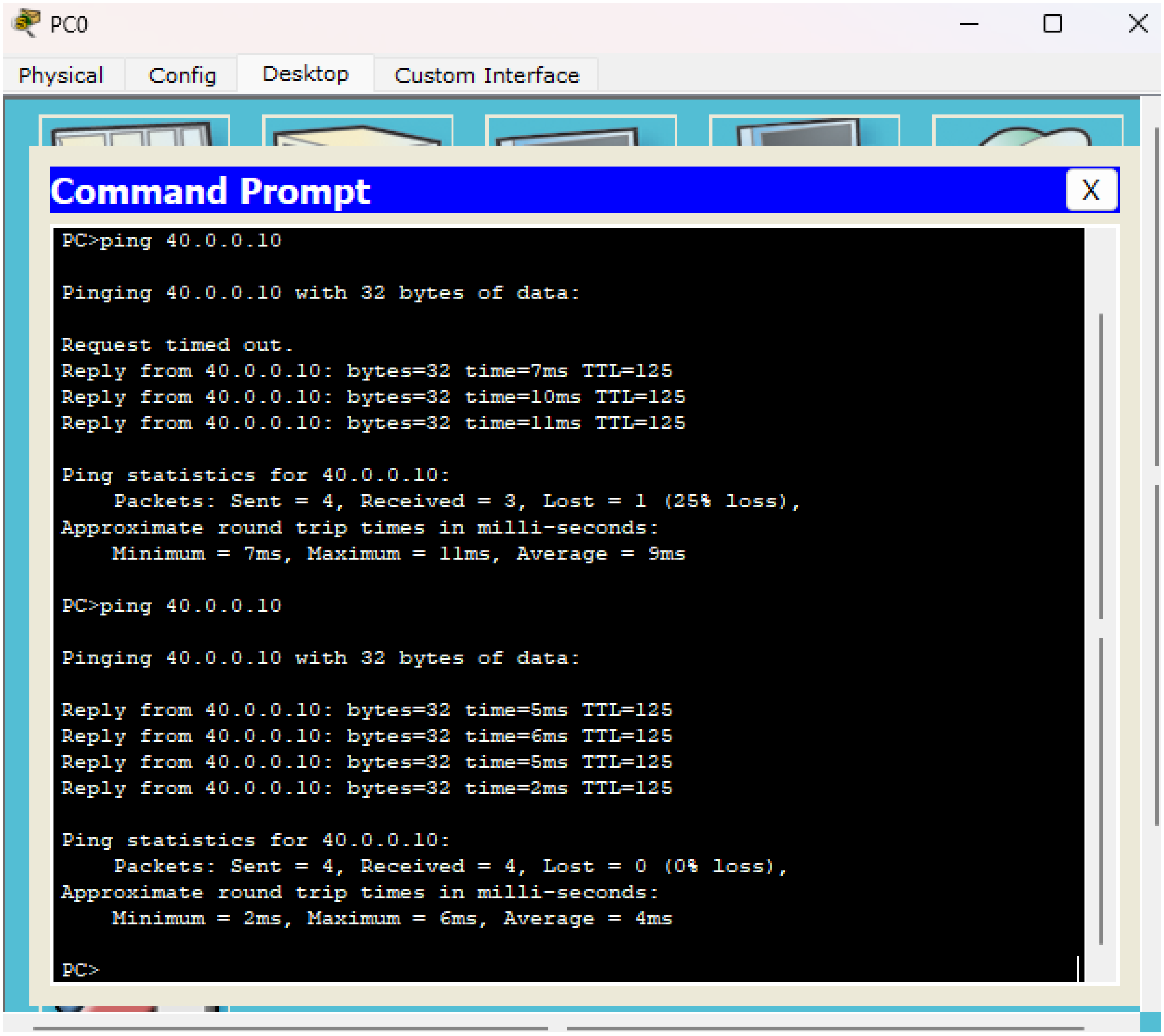
```
Press RETURN to get started.









Router>config terminal
              ^
% Invalid input detected at '^' marker.

Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```



```
Router>enable
Router#interface serial 2/0
                 ^
% Invalid input detected at '^' marker.

Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#encapsulation ppp
Router(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
xit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#interface serial 3/0
                 ^
% Invalid input detected at '^' marker.

Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down

Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

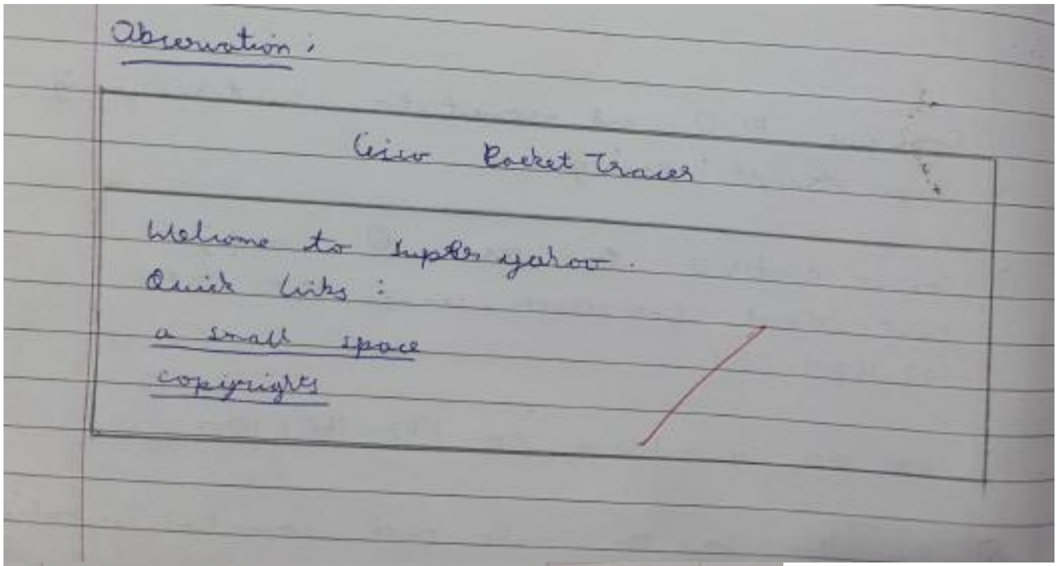


```
Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
```



```
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=7ms TTL=125
Reply from 40.0.0.10: bytes=32 time=10ms TTL=125
Reply from 40.0.0.10: bytes=32 time=11ms 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 = 7ms, Maximum = 11ms, Average = 9ms

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=5ms 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
Reply from 40.0.0.10: bytes=32 time=2ms 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 = 2ms, Maximum = 6ms, Average = 4ms

PC>
```

iv. Observation



Observation :

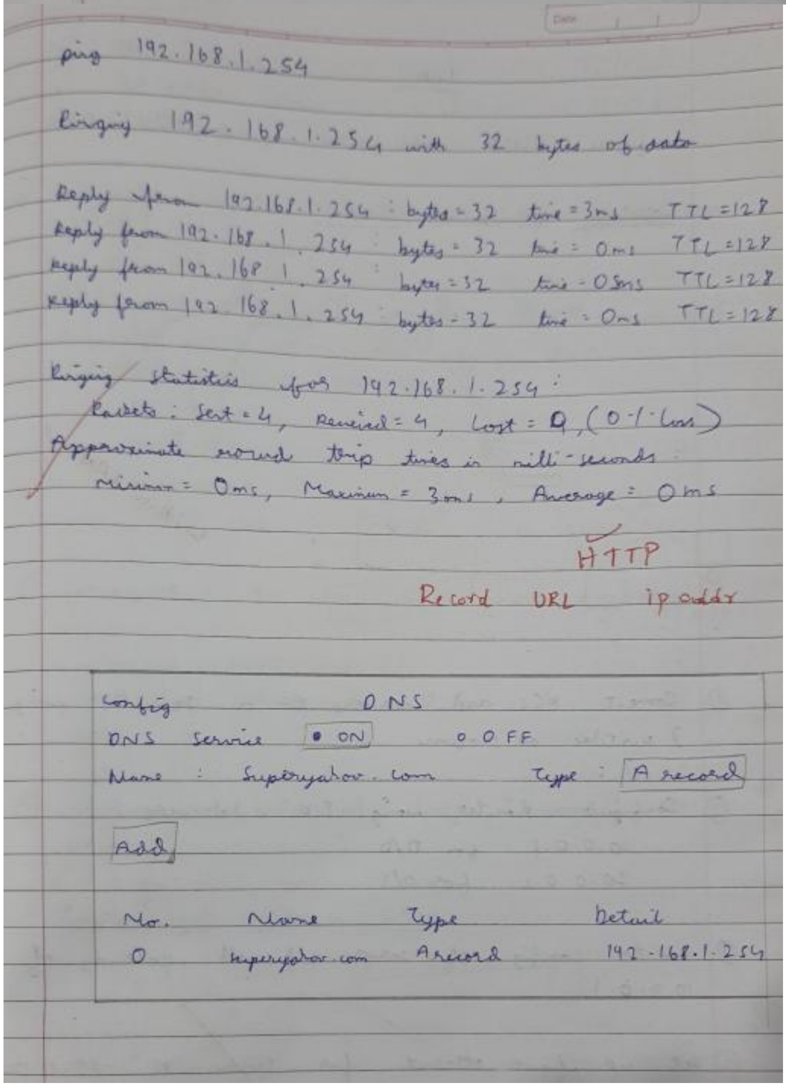
Cisco Packet Tracer

Welcome to Super yahoo.

Quick Links :

a small space

copyrights



```
ping 192.168.1.254

Pinging 192.168.1.254 with 32 bytes of data

Reply from 192.168.1.254 : bytes=32 time=3ms TTL=128
Reply from 192.168.1.254 : bytes=32 time=0ms TTL=128
Reply from 192.168.1.254 : bytes=32 time=0ms TTL=128
Reply from 192.168.1.254 : bytes=32 time=0ms TTL=128

Pinging statistics for 192.168.1.254 :
   Packets : Sent=4, Received=4, Lost=0, (0% loss)
Approximate round trip times in milli-seconds
   Minimum = 0ms, Maximum = 3ms, Average = 0ms
```

HTTP

Record URL ip addr

Config DNS

DNS Service ● ON ○ OFF

Name : Superyahoo.com Type : A record

Add

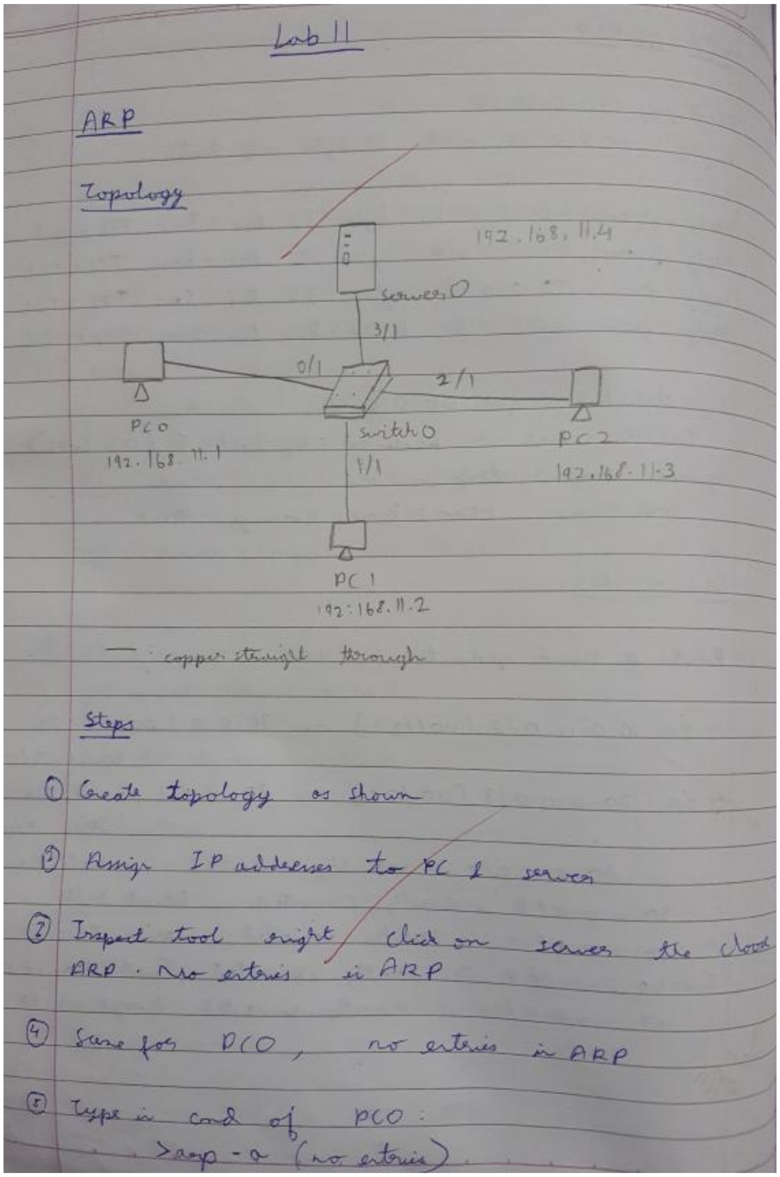
No.	Name	Type	Detail
0	superyahoo.com	A record	192.168.1.254

Program 9

i. Aim of the program

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

ii. Procedure along with the topology



Lab 11

ARP

Topology

192.168.11.4
server0
3/1
0/1
2/1
PC0
192.168.11.1
switch0
1/1
PC2
192.168.11.3
PC1
192.168.11.2

— : copper straight through

Steps

① Create topology as shown

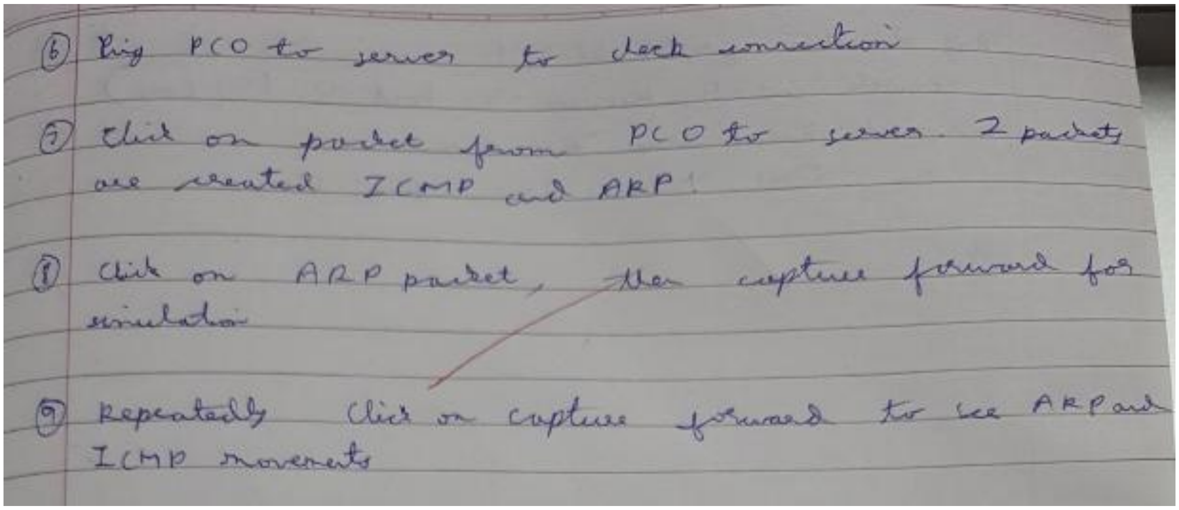
② Assign IP addresses to PC & server

③ Inspect tool right click on server the cloud ARP. No entries in ARP

④ Same for PC0, no entries in ARP

⑤ Type in cmd of PC0 :

>arp -a (no entries)



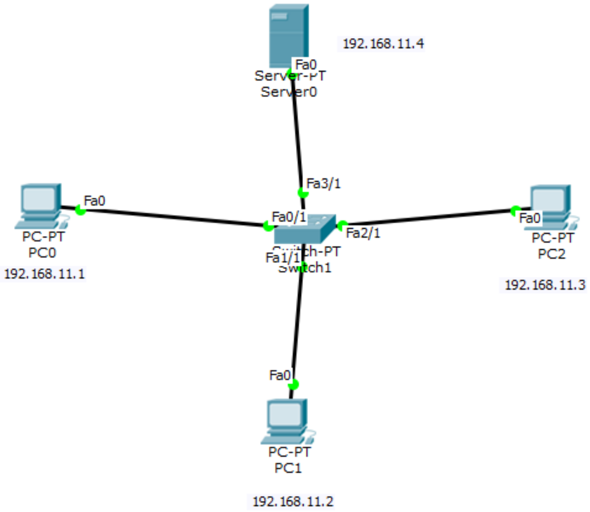
⑥ Ping PC0 to server to check connection

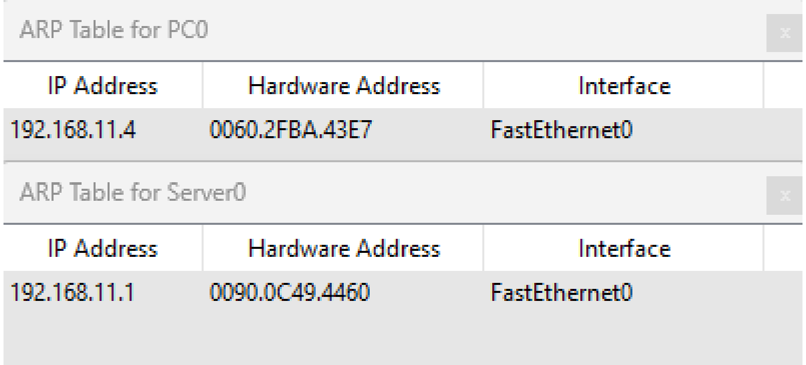
⑦ Click on packet from PC0 to server. 2 packets are created ICMP and ARP.

⑧ Click on ARP packet, then capture forward for simulation

⑨ Repeatedly Click on capture forward to see ARP and ICMP movements

iii. Screen shots/ output


192.168.11.4
Fa0
Server-PT
Server0
Fa3/1
Fa0
Fa0/1
Fa2/1
Fa0
PC-PT
PC0
192.168.11.1
Switch-PT
Switch1
Fa1/1
PC-PT
PC2
192.168.11.3
Fa0
PC-PT
PC1
192.168.11.2

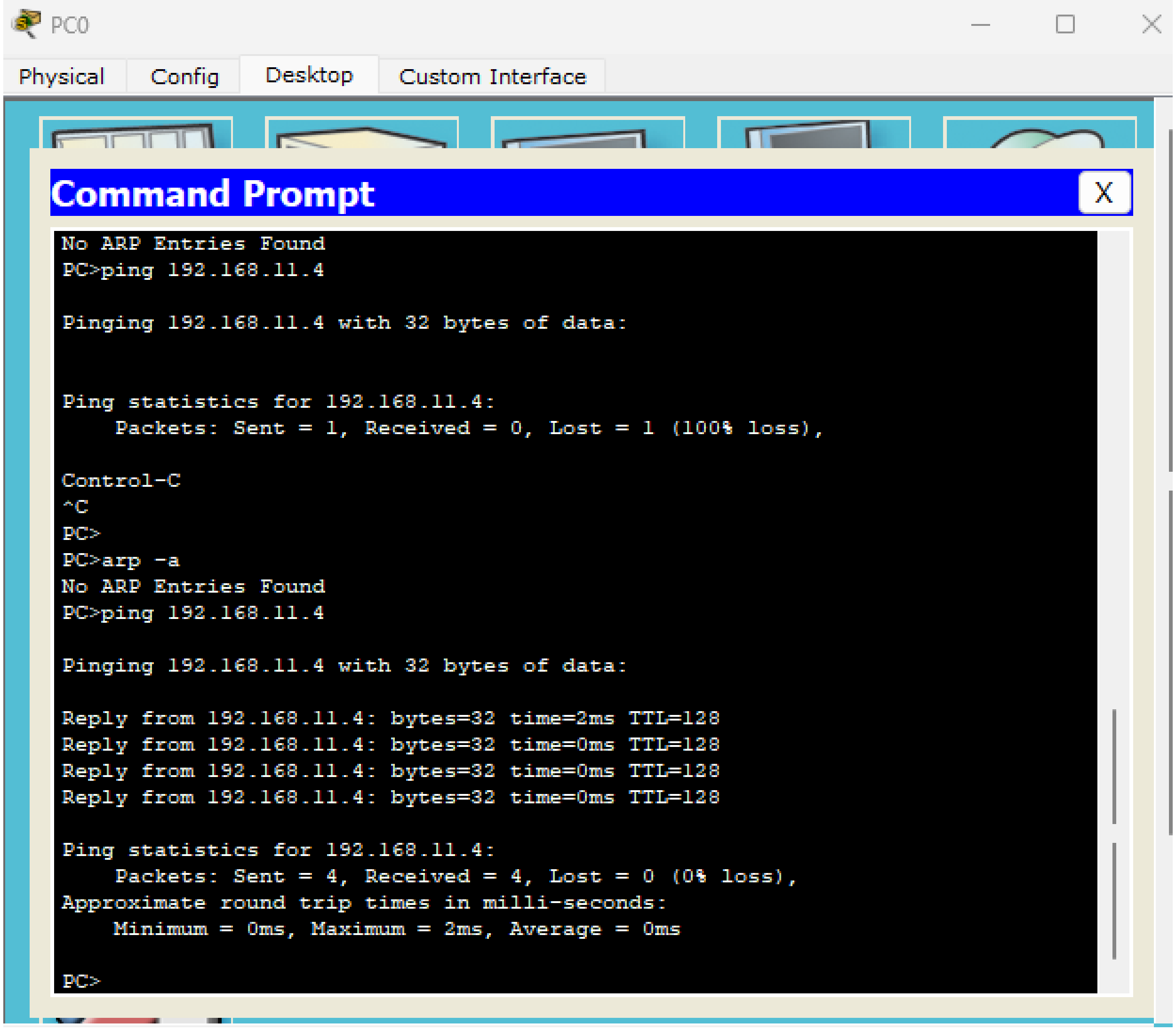


ARP Table for PC0

IP Address	Hardware Address	Interface
192.168.11.4	0060.2FBA.43E7	FastEthernet0

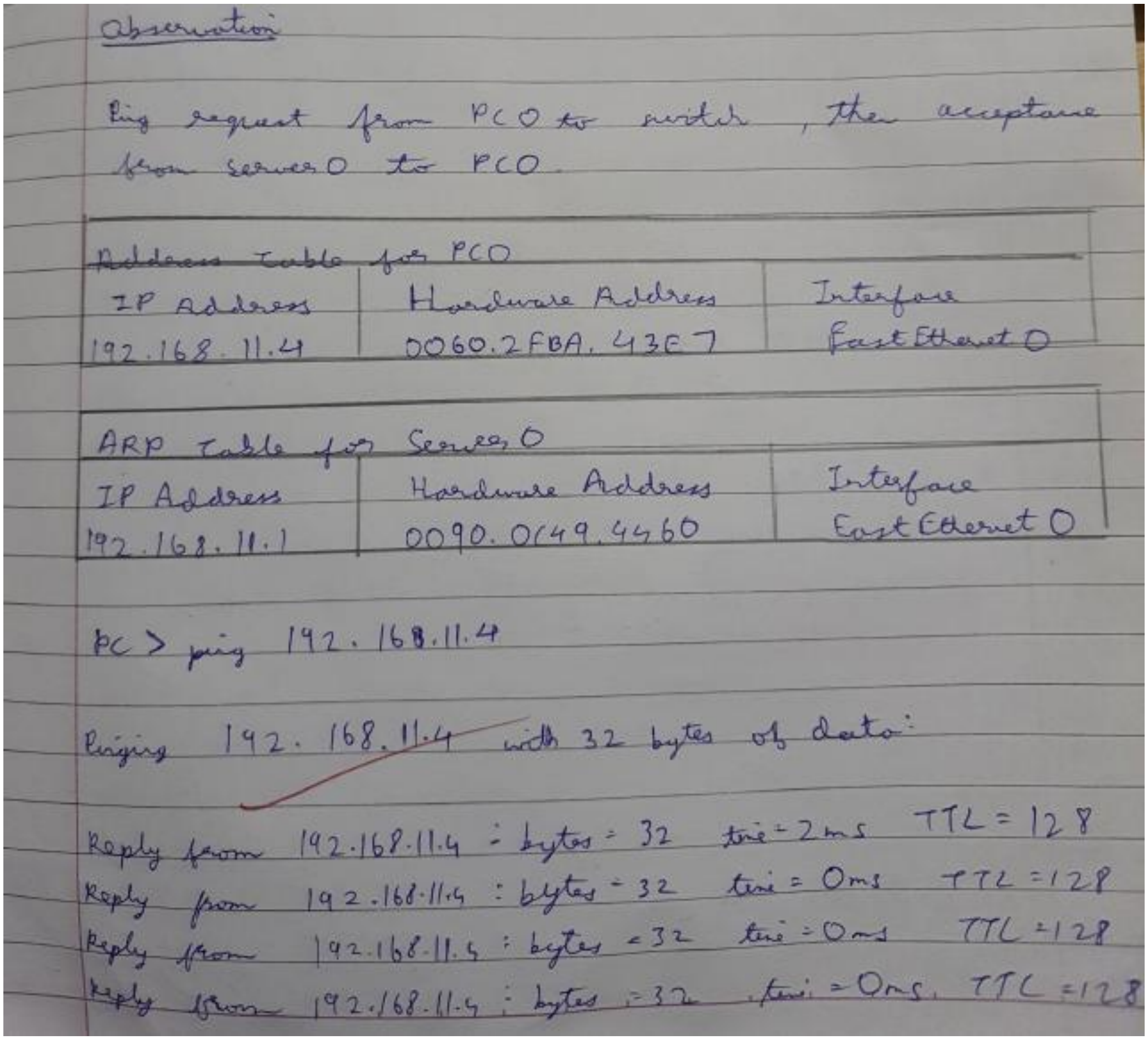
ARP Table for Server0

IP Address	Hardware Address	Interface
192.168.11.1	0090.0C49.4460	FastEthernet0



```
No ARP Entries Found
PC>ping 192.168.11.4

Pinging 192.168.11.4 with 32 bytes of data:


Ping statistics for 192.168.11.4:
    Packets: Sent = 1, Received = 0, Lost = 1 (100% loss),

Control-C
^C
PC>
PC>arp -a
No ARP Entries Found
PC>ping 192.168.11.4

Pinging 192.168.11.4 with 32 bytes of data:

Reply from 192.168.11.4: bytes=32 time=2ms TTL=128
Reply from 192.168.11.4: bytes=32 time=0ms TTL=128
Reply from 192.168.11.4: bytes=32 time=0ms TTL=128
Reply from 192.168.11.4: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.11.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms

PC>
```

iv. Observation



Observation

Ping request from PC0 to switch, then acceptance from server0 to PC0.

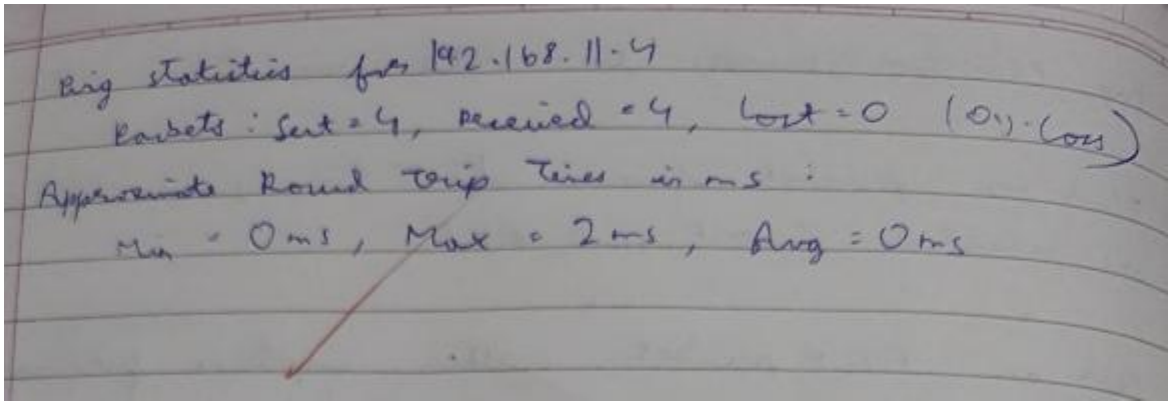
Address Table for PC0

IP Address	Hardware Address	Interface
192.168.11.4	0060.2FBA.43E7	Fast Ethernet 0

ARP Table for Server 0

IP Address	Hardware Address	Interface
192.168.11.1	0090.0C49.4460	Fast Ethernet 0

```
PC > ping 192.168.11.4

Pinging 192.168.11.4 with 32 bytes of data:

Reply from 192.168.11.4 : bytes = 32  time = 2ms  TTL = 128
Reply from 192.168.11.4 : bytes = 32  time = 0ms  TTL = 128
Reply from 192.168.11.4 : bytes = 32  time = 0ms  TTL = 128
Reply from 192.168.11.4 : bytes = 32, time = 0ms, TTL = 128
```



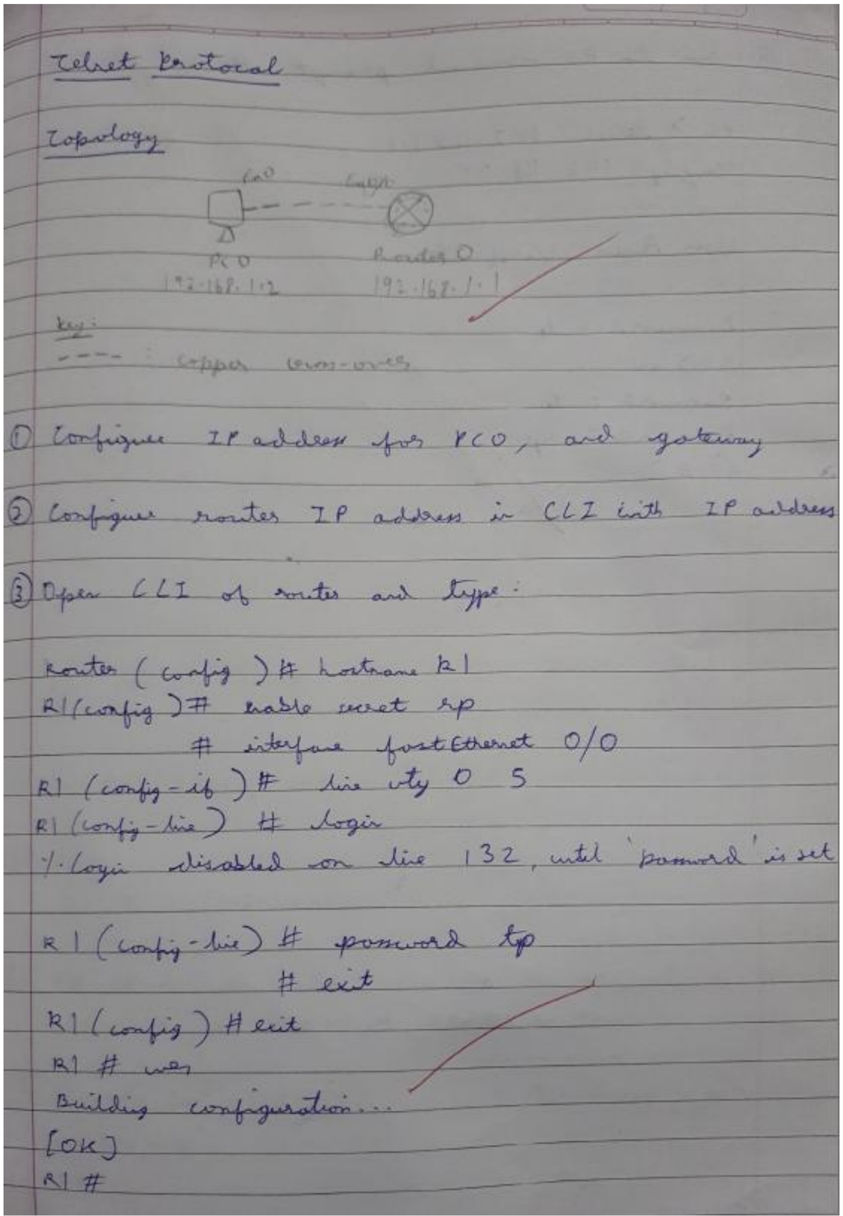
```
Ping statistics for 192.168.11.4
    Packets : Sent = 4, Received = 4, Lost = 0 (0% Loss)
Approximate Round Trip Times in ms :
    Min = 0ms, Max = 2ms, Avg = 0ms
```

Program 10

i. Aim of the program

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

ii. Procedure along with the topology



Telnet Protocal

Topology

Fa0
Fa0/0
PC 0
192.168.1.2
Router 0
192.168.1.1

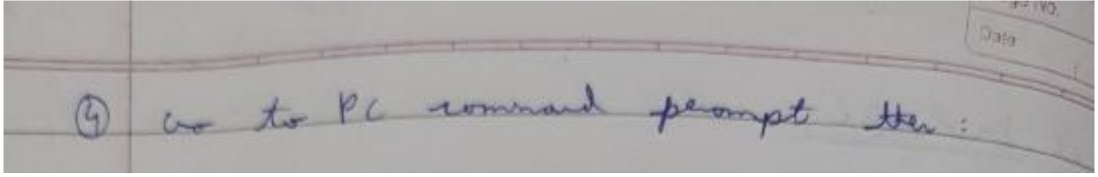
key:
---- : copper cross-over

① Configure IP address for PC0, and gateway

② Configure routes IP address in CLI with IP address

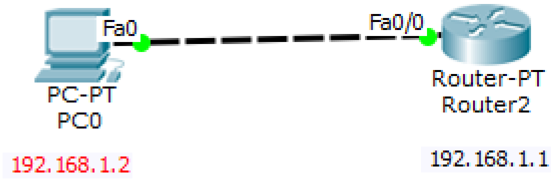
③ Open CLI of routes and type:

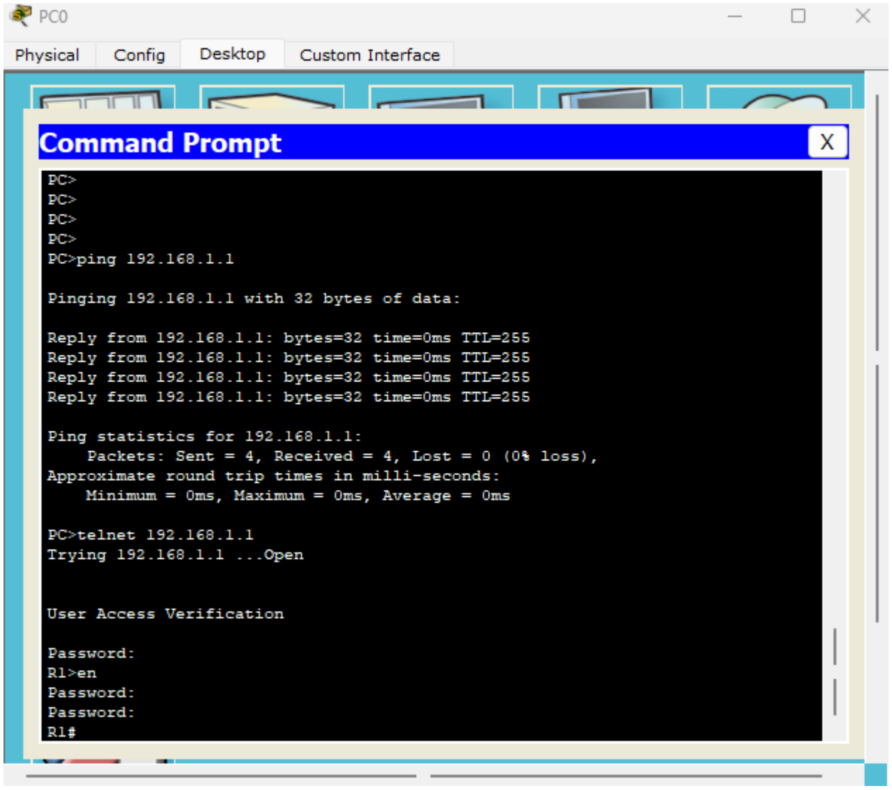
```
Router (config)# hostname R1
R1(config)# enable secret rp
            # interface fastEthernet 0/0
R1 (config-if)# line vty 0 5
R1 (config-line) # login
% Login disabled on line 132, until 'password' is set

R1 (config-line) # password tp
                 # exit
R1 (config) # exit
R1 # wr
Building configuration...
[OK]
R1 #
```



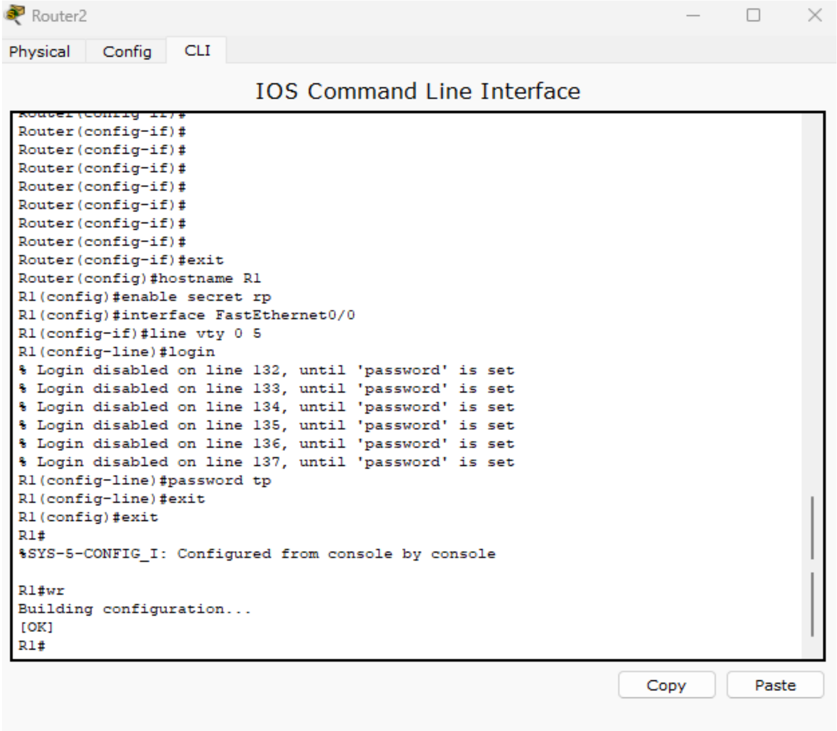
④ Go to PC command prompt then :

iii. Screen shots/ output


Fa0
Fa0/0
PC-PT
PC0
Router-PT
Router2
192.168.1.2
192.168.1.1

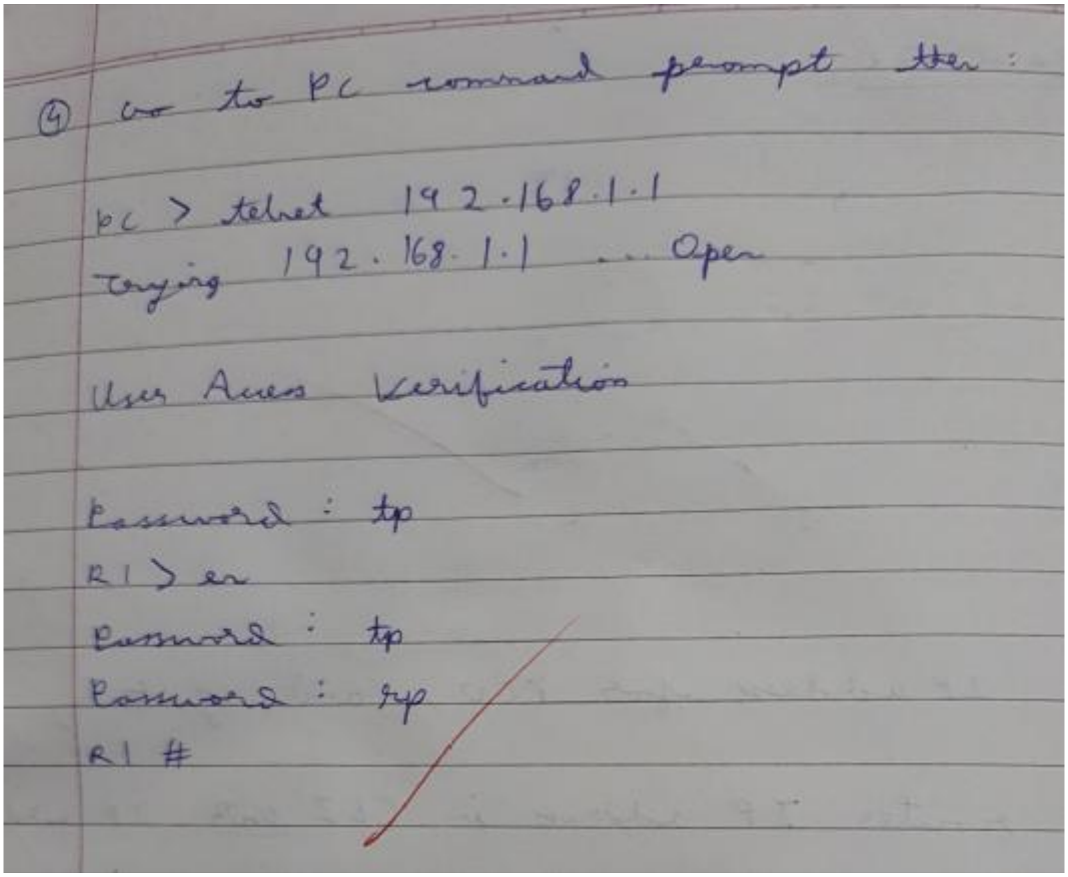

PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X

```
PC>
PC>
PC>
PC>
PC>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=0ms TTL=255
Reply from 192.168.1.1: bytes=32 time=0ms TTL=255
Reply from 192.168.1.1: bytes=32 time=0ms TTL=255
Reply from 192.168.1.1: bytes=32 time=0ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>telnet 192.168.1.1
Trying 192.168.1.1 ...Open


User Access Verification

Password:
R1>en
Password:
Password:
R1#
```



```
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#hostname R1
R1(config)#enable secret rp
R1(config)#interface FastEthernet0/0
R1(config-if)#line vty 0 5
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
% Login disabled on line 136, until 'password' is set
% Login disabled on line 137, until 'password' is set
R1(config-line)#password tp
R1(config-line)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

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

iv. Observation



④ Go to PC command prompt then :

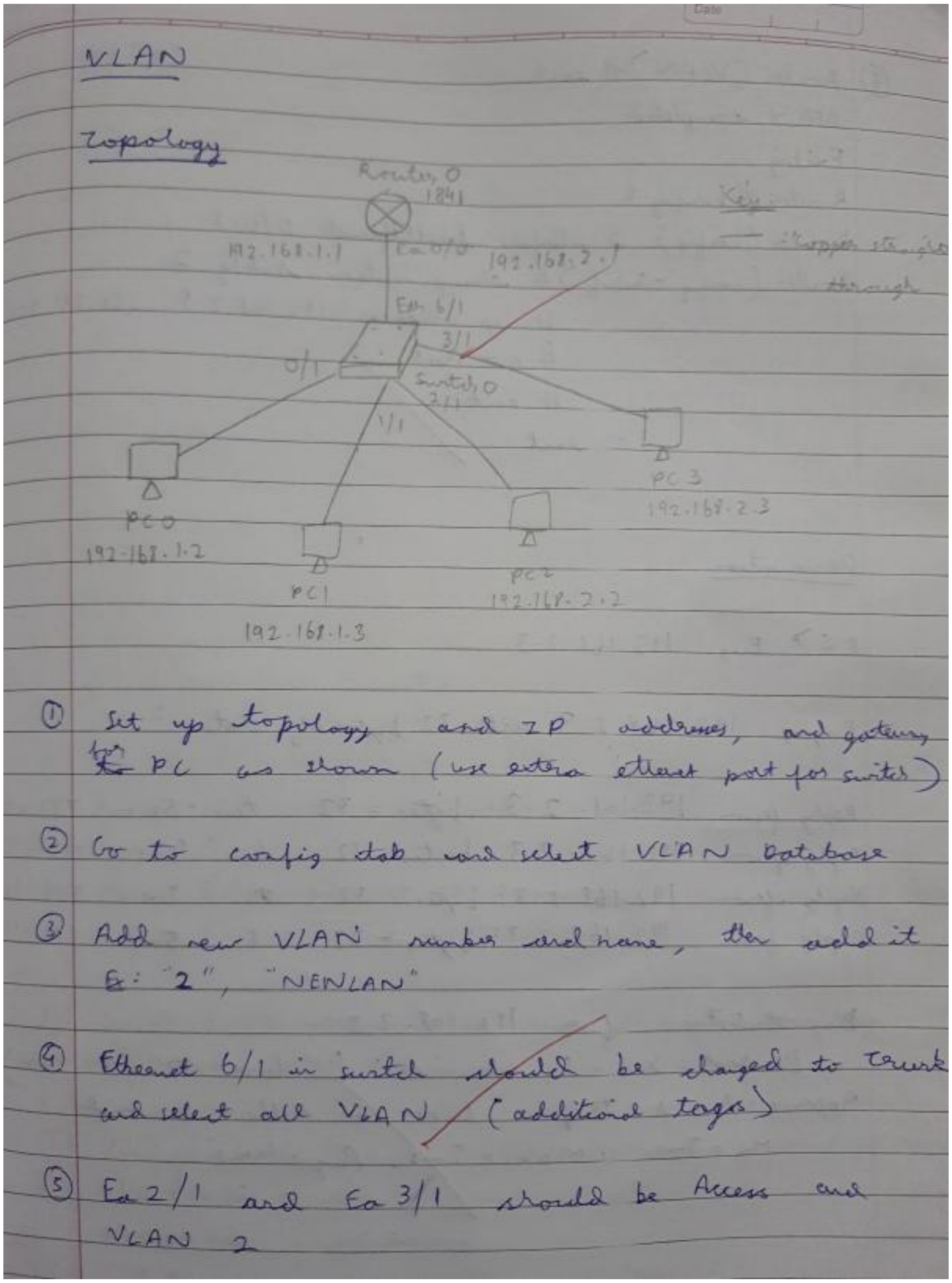
```
PC > telnet 192.168.1.1
Trying 192.168.1.1 ... Open

User Access Verification

Password : tp
R1 > en
Password : tp
Password : rp
R1 #
```

Program 11

i. Aim of the program

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

ii. Procedure along with the topology



VLAN

Topology

Router 0
1841
192.168.1.1
Ea 0/0
192.168.2.1
Key
— : Copper straight through
Eth 6/1
3/1
0/1
Switch 0
2/1
1/1
PC 0
192.168.1.2
PC 1
192.168.1.3
PC 2
192.168.2.2
PC 3
192.168.2.3

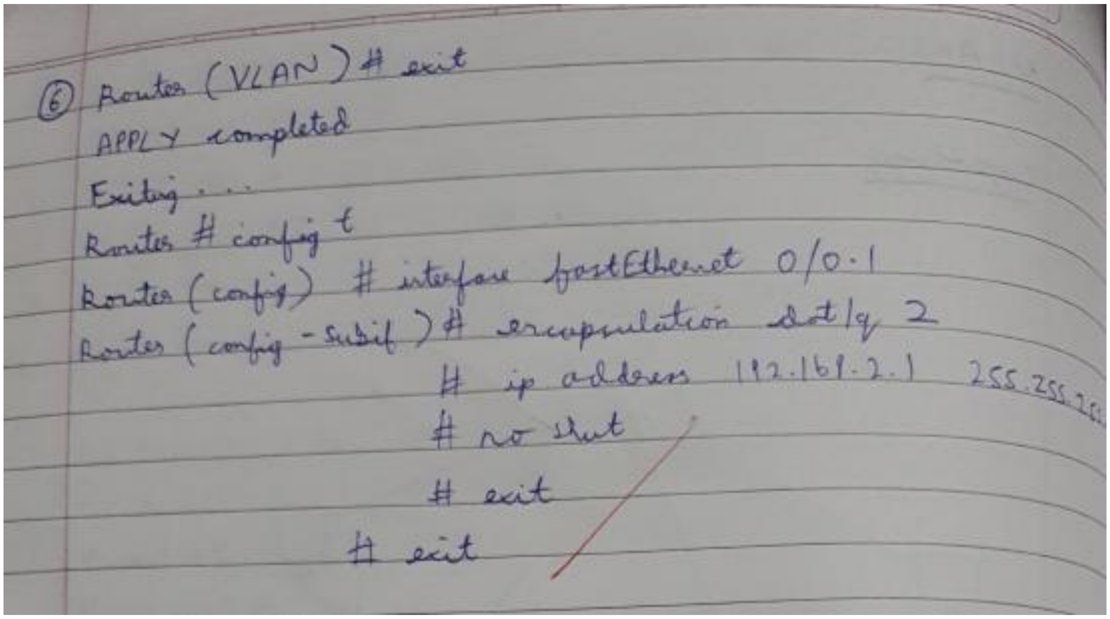
① Set up topology and IP addresses, and gateway ~~to~~ for PC as shown (use extra ethernet port for switch)

② Go to config tab and select VLAN Database

③ Add new VLAN number and name, then add it
Ex: 2", "NEWLAN"

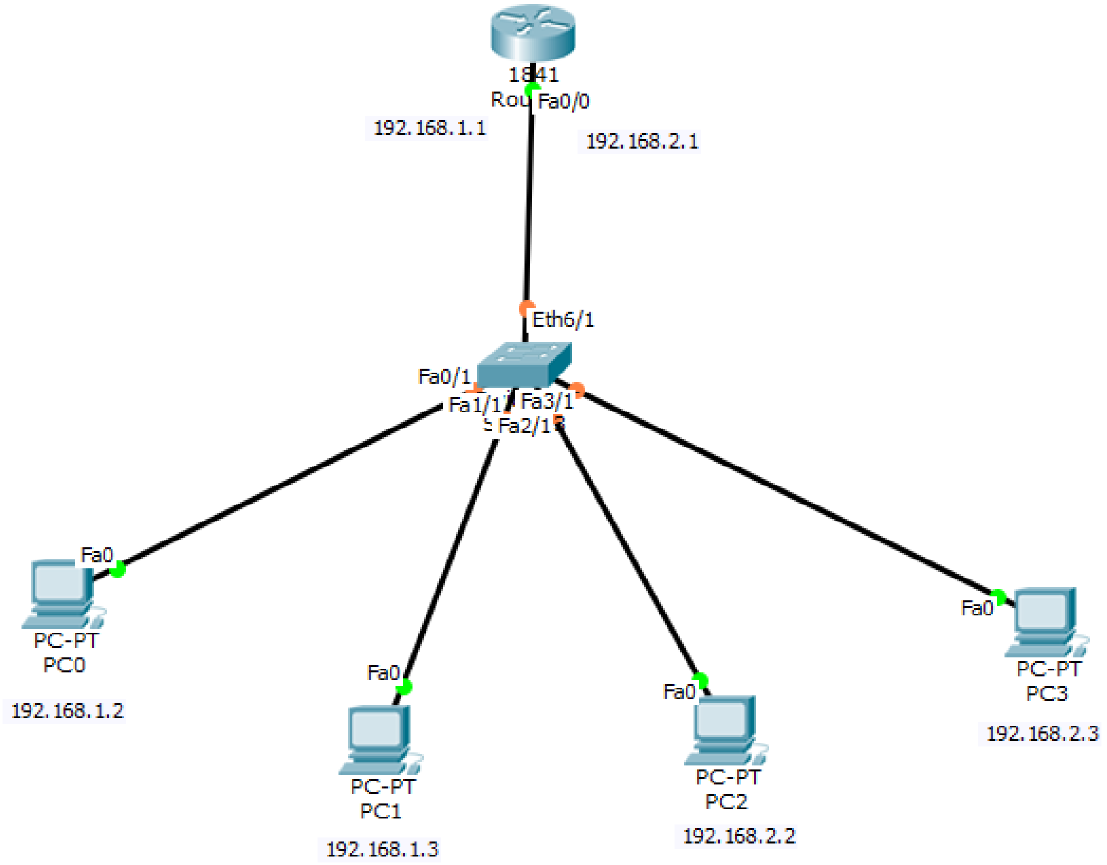
④ Ethernet 6/1 in switch should be changed to trunk and select all VLAN (additional tags)

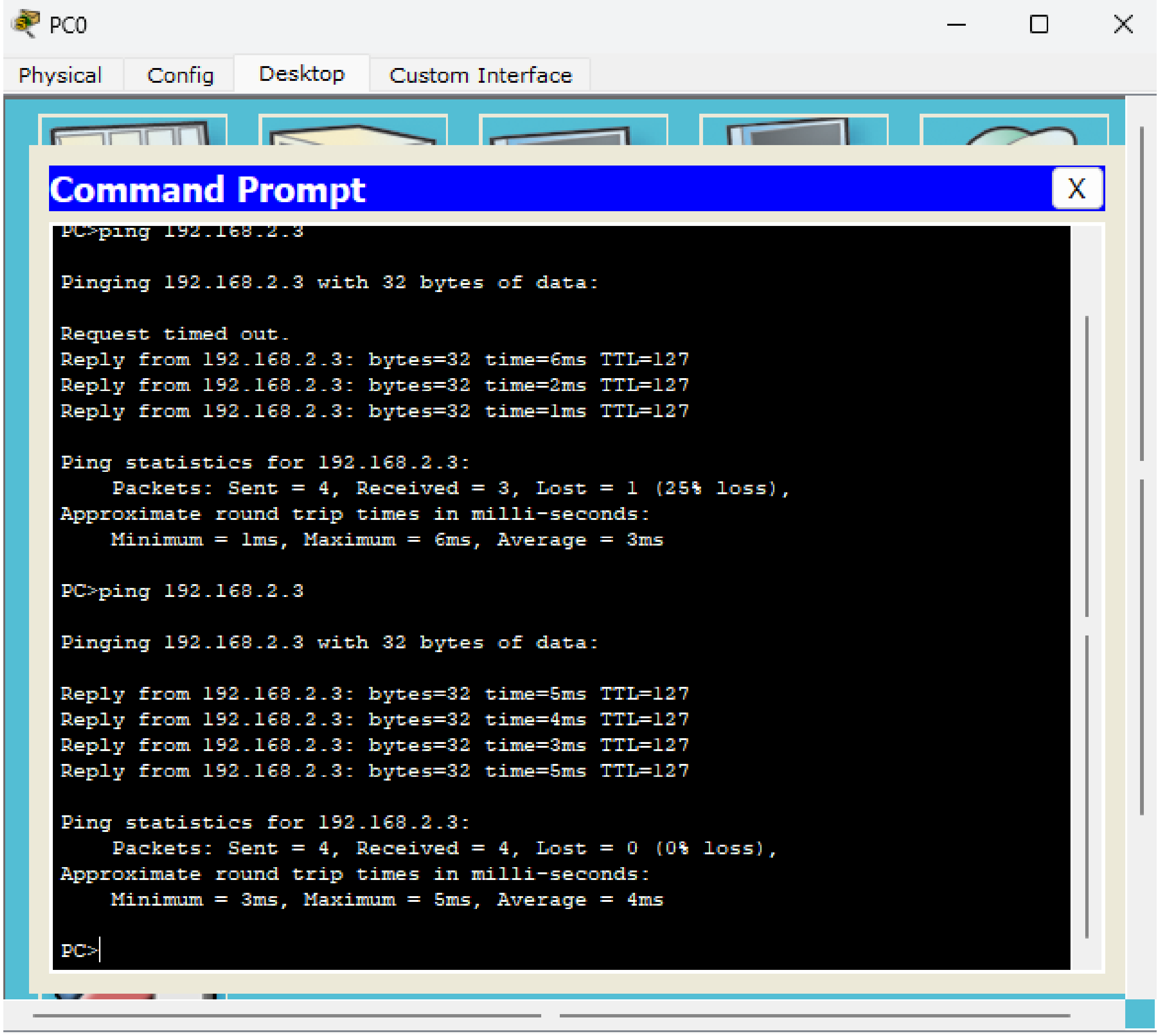
⑤ Ea 2/1 and Ea 3/1 should be Access and VLAN 2



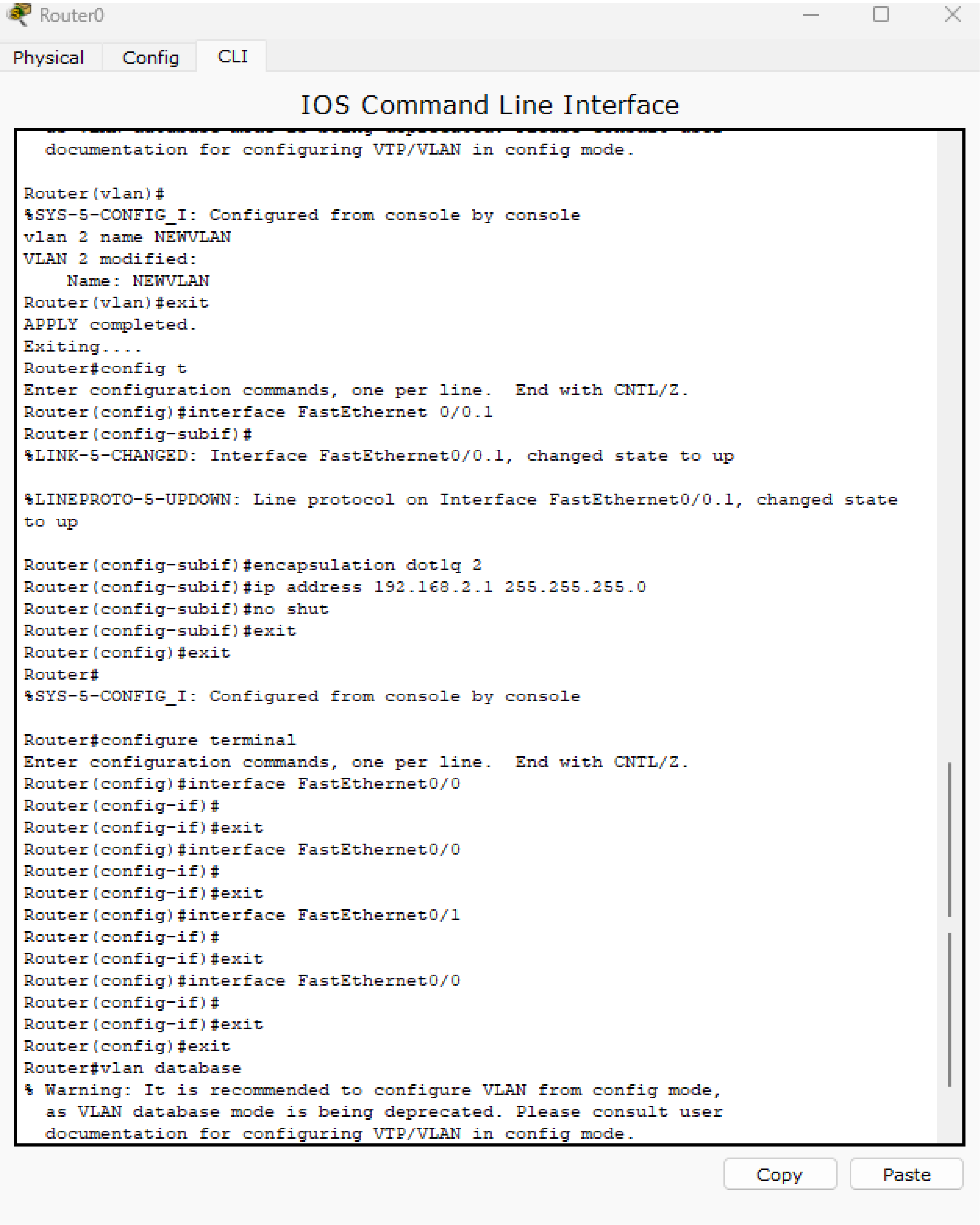
```
⑥ Router (VLAN)# exit
APPLY completed
Exiting....
Router # config t
Router (config) # interface fastEthernet 0/0.1
Router (config-subif)# encapsulation dot1q 2
                  # ip address 192.168.2.1 255.255.25
                  # no shut
                  # exit
               # exit
```

iii. Screen shots/ output


1841
Rou
Fa0/0
192.168.1.1
192.168.2.1
Eth6/1
Fa0/1
Fa1/1
Fa3/1
Fa2/1
Fa0
PC-PT
PC0
192.168.1.2
Fa0
PC-PT
PC1
192.168.1.3
Fa0
PC-PT
PC2
192.168.2.2
Fa0
PC-PT
PC3
192.168.2.3

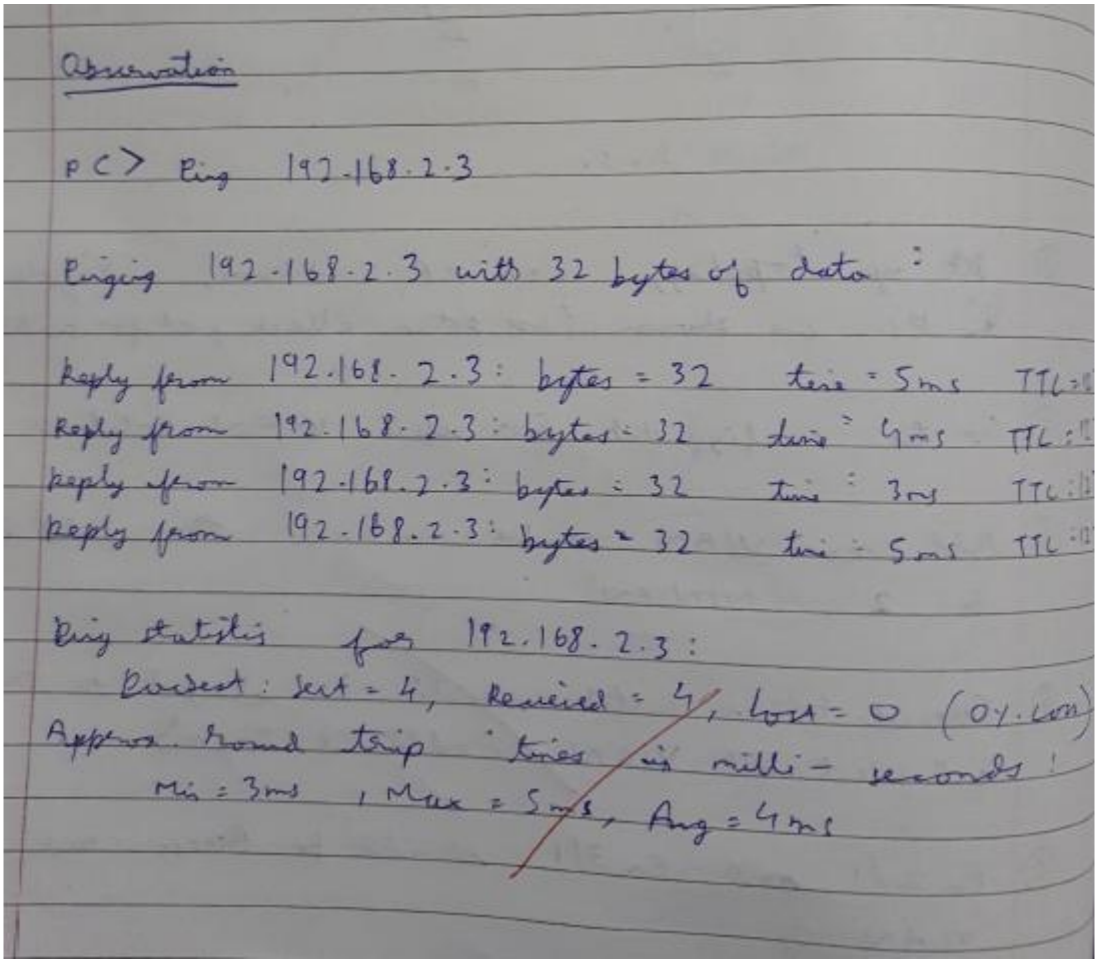


```
PC>ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.2.3: bytes=32 time=6ms 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 = 6ms, Average = 3ms

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=5ms TTL=127
Reply from 192.168.2.3: bytes=32 time=4ms TTL=127
Reply from 192.168.2.3: bytes=32 time=3ms TTL=127
Reply from 192.168.2.3: bytes=32 time=5ms 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 = 3ms, Maximum = 5ms, Average = 4ms

PC>
```



```
  documentation for configuring VTP/VLAN in config mode.

Router(vlan)#
%SYS-5-CONFIG_I: Configured from console by console
vlan 2 name NEWVLAN
VLAN 2 modified:
    Name: NEWVLAN
Router(vlan)#exit
APPLY completed.
Exiting....
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet 0/0.1
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#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#exit
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.
```

iv. Observation



Observation

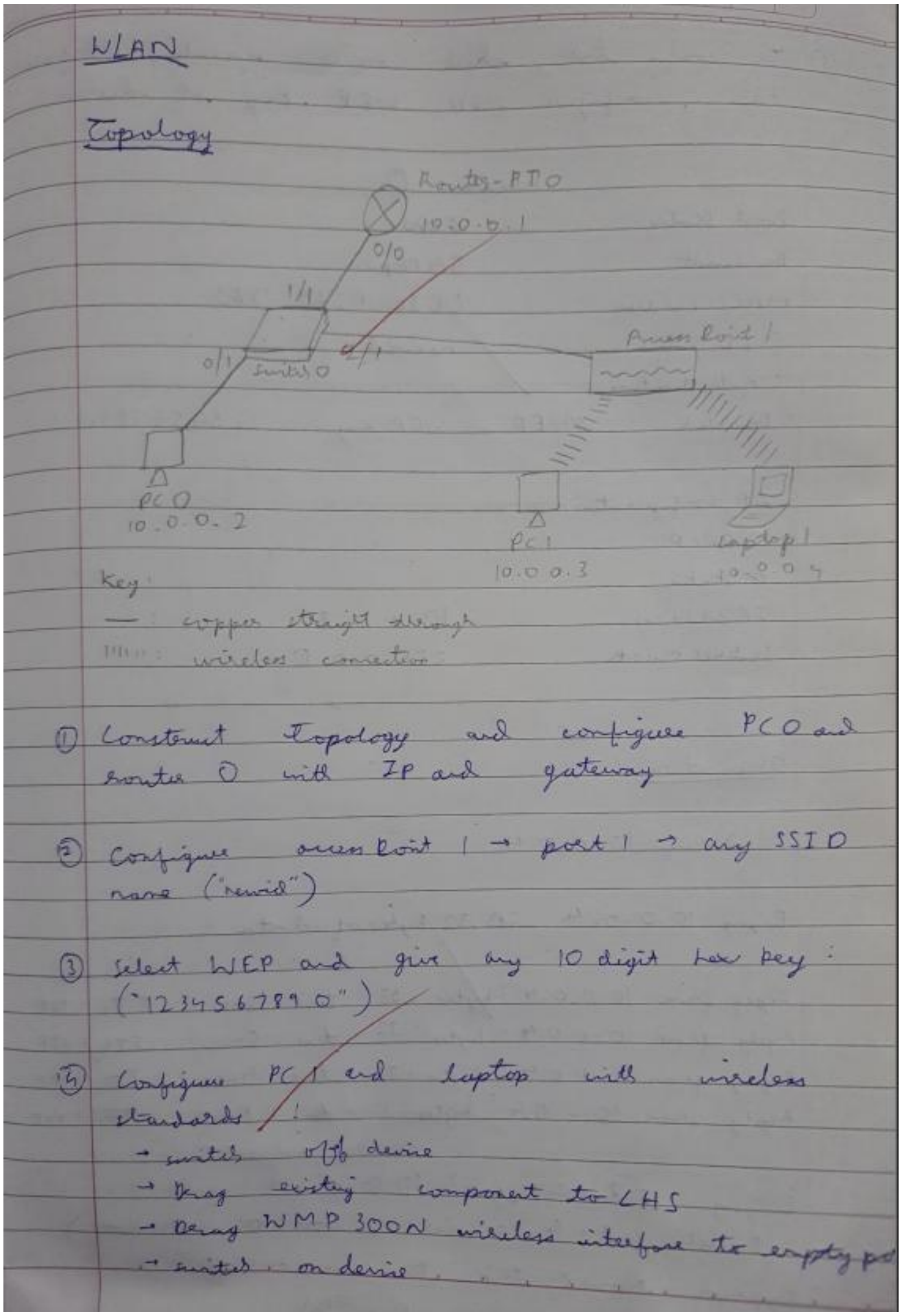
```
PC> Ping 192.168.2.3

Pinging 192.168.2.3 with 32 bytes of data :

Reply from 192.168.2.3: bytes = 32   time = 5ms   TTL=
Reply from 192.168.2.3: bytes = 32   time = 4ms   TTL:
Reply from 192.168.2.3: bytes = 32   time : 3ms   TTL:
Reply from 192.168.2.3: bytes = 32   time : 5ms   TTL:

Ping statistics   for 192.168.2.3 :
   Packets : Sent = 4,  Received = 4, Lost = 0 (0%.los
Approx. round trip times in milli-seconds :
       Min = 3ms , Max = 5ms, Avg = 4ms
```

Program 12

i. Aim of the program

To construct a WLAN and make the nodes communicate wirelessly

ii. Procedure along with the topology



Router-PT0
10.0.0.1
0/0
1/1
0/1
switch 0
2/1
Access Point 1
PC0
10.0.0.2
PC1
10.0.0.3
Laptop1
10.0.0.4

WLAN

Topology

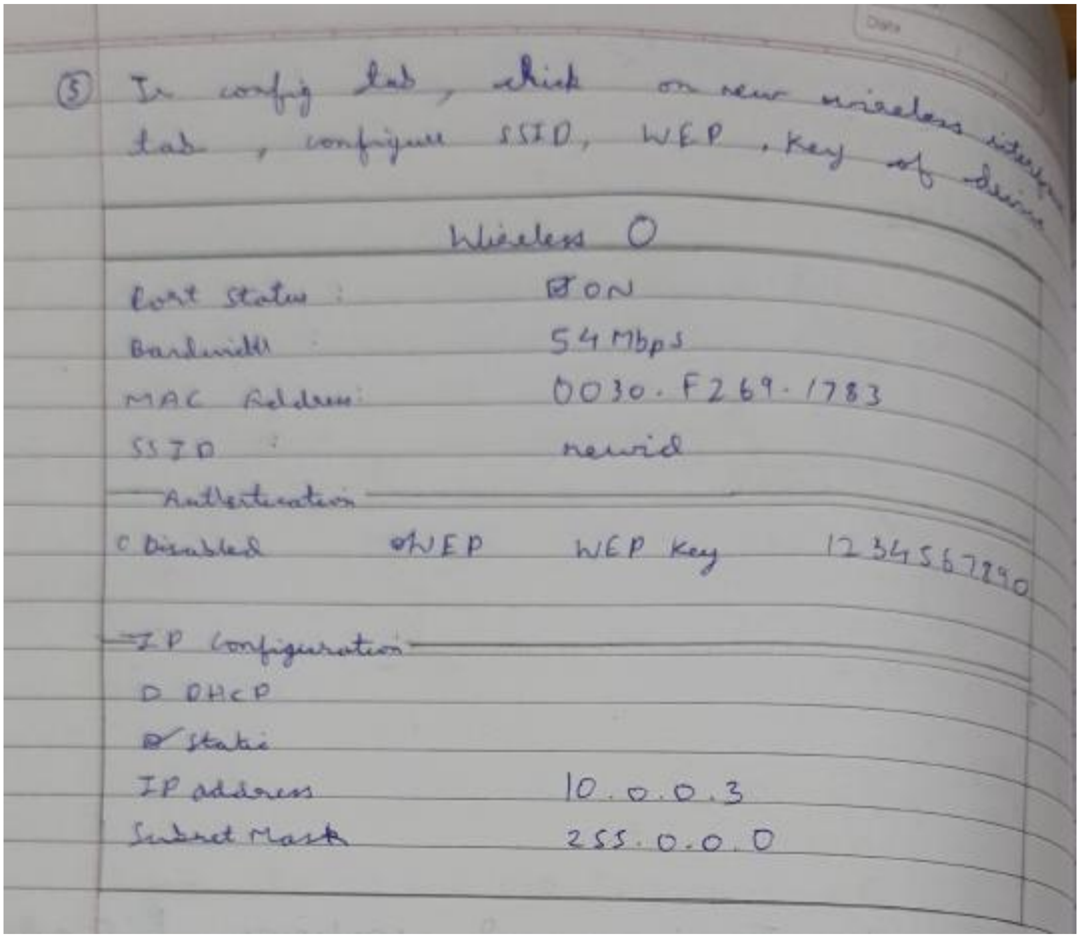
Key:
— : copper straight through
//// : wireless connection

① Construct Topology and configure PC0 and router 0 with IP and gateway

② Configure access Point 1 → port 1 → any SSID name ("rewid")

③ Select WEP and give any 10 digit hex key : ("1234567890")

④ Configure PC1 and laptop with wireless standards :
- → switch off device
- → Drag existing component to LHS
- → Drag WMP 300N wireless interface to empty po
- → switch on device



⑤ In config tab, click on new wireless interface tab, configure SSID, WEP, Key of device

Wireless 0

Port Status :	☑ ON
Bandwidth :	54 Mbps
MAC Address:	0030.F269.1783
SSID :	newid

Authentication

○ Disabled ● WEP WEP Key 1234567890

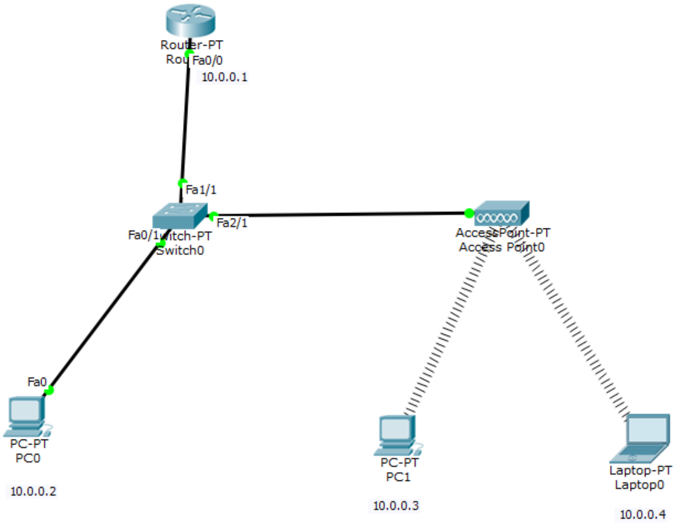
IP Configuration

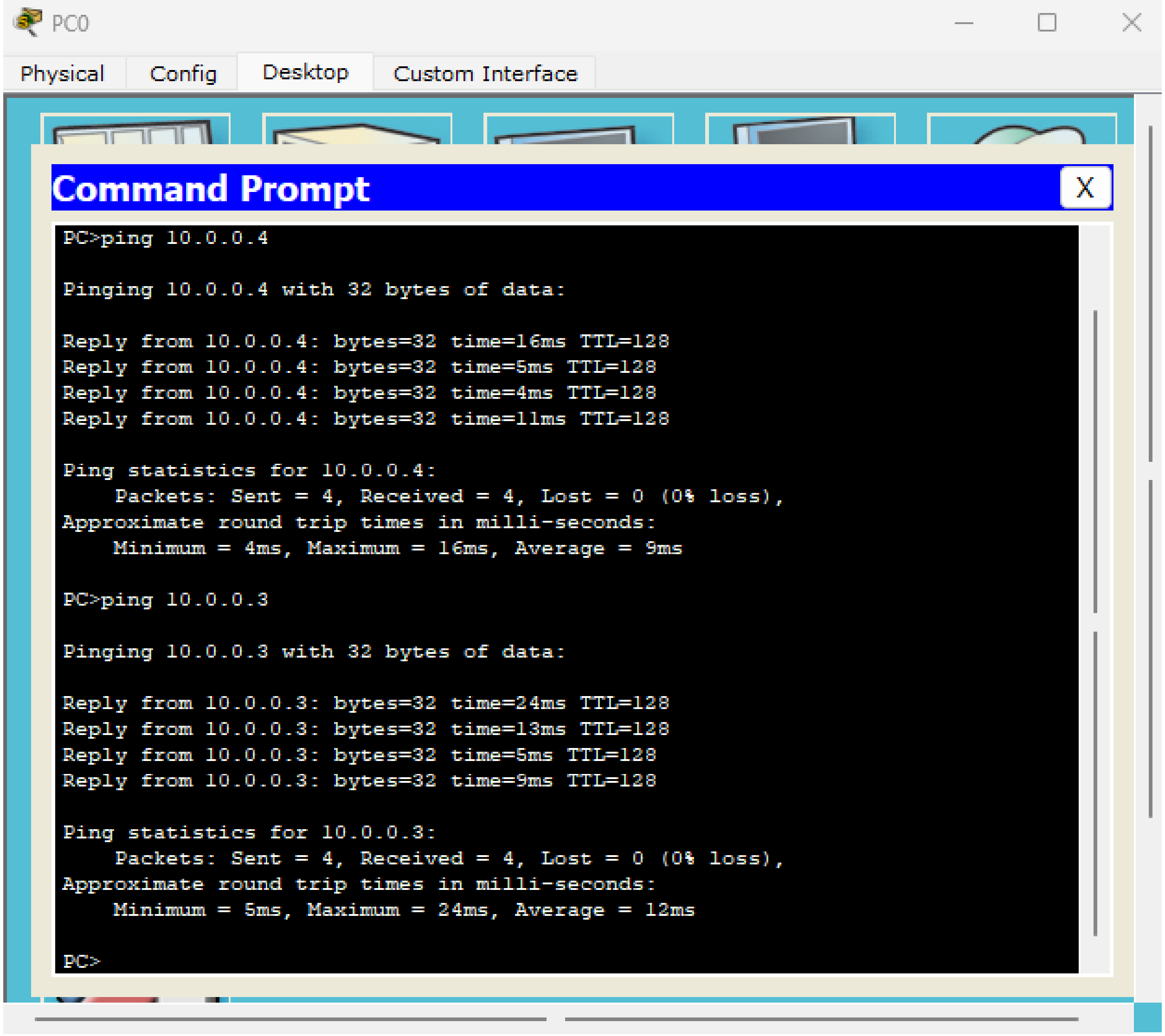
○ DHCP

☑ Static

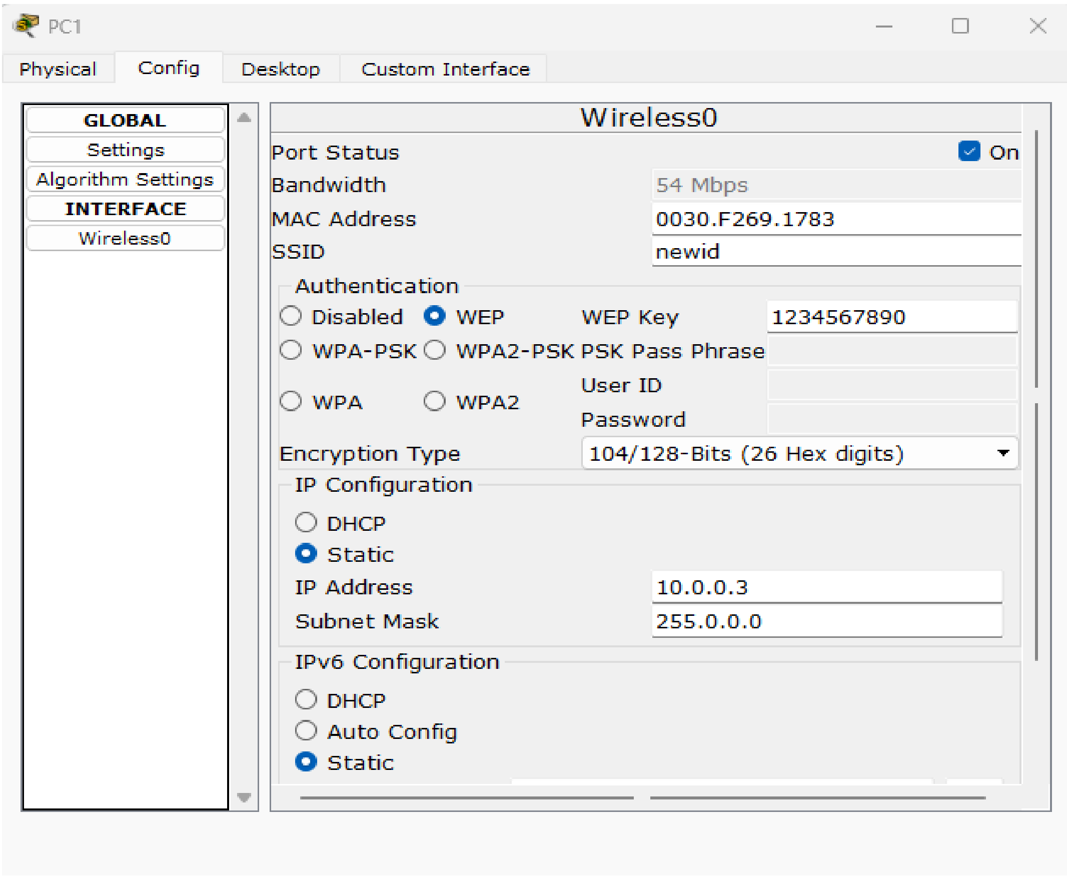
IP address	10.0.0.3
Subnet Mask	255.0.0.0

iii. Screen shots/ output


Router-PT
Router0
Fa0/0
10.0.0.1
Fa1/1
Fa2/1
Fa0/1
Switch-PT
Switch0
AccessPoint-PT
Access Point0
Fa0
PC-PT
PC0
10.0.0.2
PC-PT
PC1
10.0.0.3
Laptop-PT
Laptop0
10.0.0.4



```
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=16ms TTL=128
Reply from 10.0.0.4: bytes=32 time=5ms TTL=128
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128
Reply from 10.0.0.4: bytes=32 time=11ms 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 = 4ms, Maximum = 16ms, Average = 9ms

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=24ms TTL=128
Reply from 10.0.0.3: bytes=32 time=13ms TTL=128
Reply from 10.0.0.3: bytes=32 time=5ms TTL=128
Reply from 10.0.0.3: bytes=32 time=9ms 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 = 5ms, Maximum = 24ms, Average = 12ms

PC>
```


PC1
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0

Wireless0

Port Status ☑ On

Bandwidth: 54 Mbps

MAC Address: 0030.F269.1783

SSID: newid

Authentication

○ Disabled ● WEP WEP Key: 1234567890

○ WPA-PSK ○ WPA2-PSK PSK Pass Phrase

○ WPA ○ WPA2 User ID / Password

Encryption Type: 104/128-Bits (26 Hex digits)

IP Configuration

○ DHCP

● Static

IP Address: 10.0.0.3

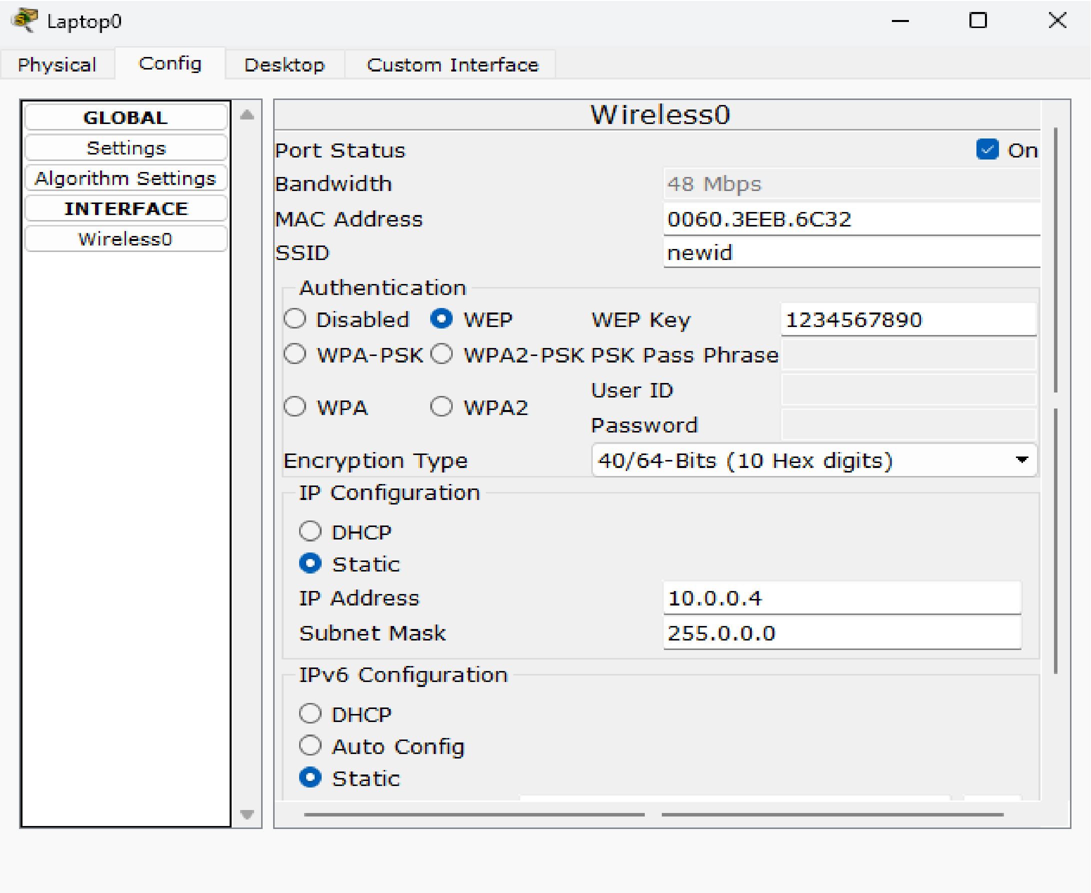
Subnet Mask: 255.0.0.0

IPv6 Configuration

○ DHCP

○ Auto Config

● Static


Laptop0
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
Algorithm Settings
INTERFACE
Wireless0

Wireless0

Port Status ☑ On

Bandwidth: 48 Mbps

MAC Address: 0060.3EEB.6C32

SSID: newid

Authentication

○ Disabled ● WEP WEP Key: 1234567890

○ WPA-PSK ○ WPA2-PSK PSK Pass Phrase

○ WPA ○ WPA2 User ID / Password

Encryption Type: 40/64-Bits (10 Hex digits)

IP Configuration

○ DHCP

● Static

IP Address: 10.0.0.4

Subnet Mask: 255.0.0.0

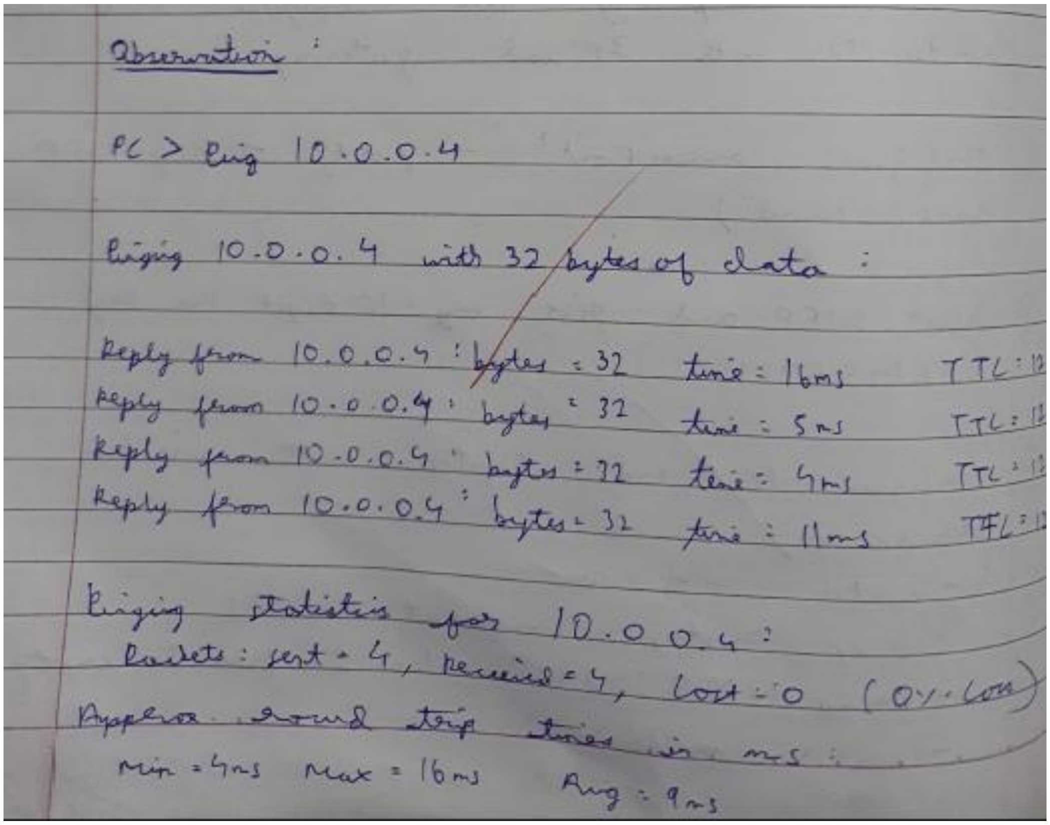
IPv6 Configuration

○ DHCP

○ Auto Config

● Static

iv. Observation



Observation :

```
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 = 16ms   TTL : 1
Reply from 10.0.0.4 : bytes = 32   time = 5ms    TTL : 1
Reply from 10.0.0.4 : bytes = 32   time = 4ms    TTL : 1
Reply from 10.0.0.4 : bytes = 32   time = 11ms   TFL : 1

Pinging statistics for 10.0.0.4 :
  Packets : sent = 4, received = 4, lost = 0 (0% loss)
Approx round trip times in ms :
  Min = 4ms   Max = 16ms   Avg = 9ms
```

Program 13

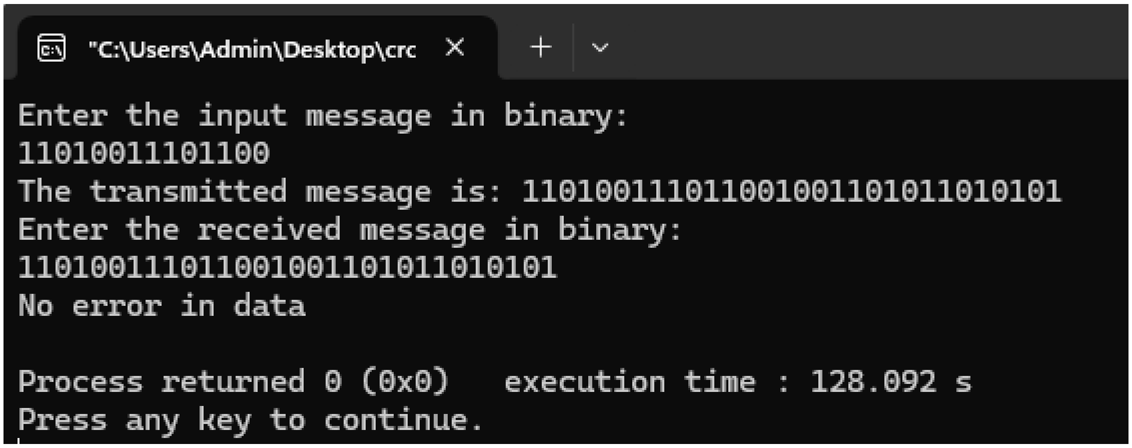
i. Aim of the program

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

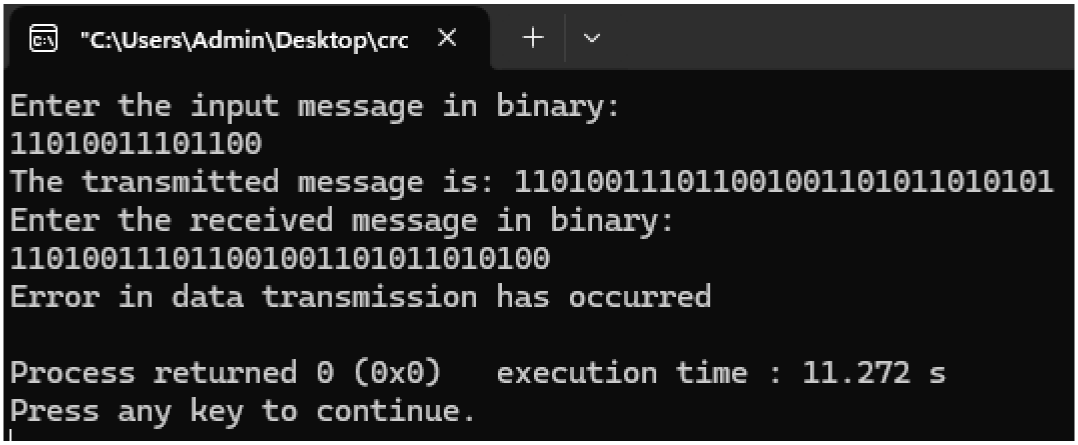
ii. Procedure along with the topology

```
#include <iostream>
#include <cstring>
using namespace std;

int crc(char *ip, char *op, char *poly, int mode) {
    strcpy(op, ip);

    // Append zeros if mode is 1 (transmitting)
    if (mode) {
        for (int i = 1; i < strlen(poly); i++) {
            strcat(op, "0");
        }
    }

    // Perform XOR on the message with the selected polynomial
    for (int i = 0; i < strlen(ip); i++) {
        if (op[i] == '1') {
            for (int j = 0; j < strlen(poly); j++) {
                if (op[i + j] == poly[j])
                    op[i + j] = '0';
                else
                    op[i + j] = '1';
            }
        }
    }

    // Check for errors. Return 0 if error detected
    for (int i = 0; i < strlen(op); i++) {
        if (op[i] == '1')
            return 0;
    }

    return 1;
}

int main() {
    char ip[50], op[50], recv[50];
    char poly[] = "10001000000100011";
    cout << "Enter the input message in binary: " << endl;
    cin >> ip;

    crc(ip, op, poly, 1);

    cout << "The transmitted message is: " << ip << op + strlen(ip) << endl;

    cout << "Enter the received message in binary: " << endl;
    cin >> recv;

    if (crc(recv, op, poly, 0))
        cout << "No error in data" << endl;
    else
        cout << "Error in data transmission has occurred" << endl;

    return 0;
}
```

iii. Screen shots/ output

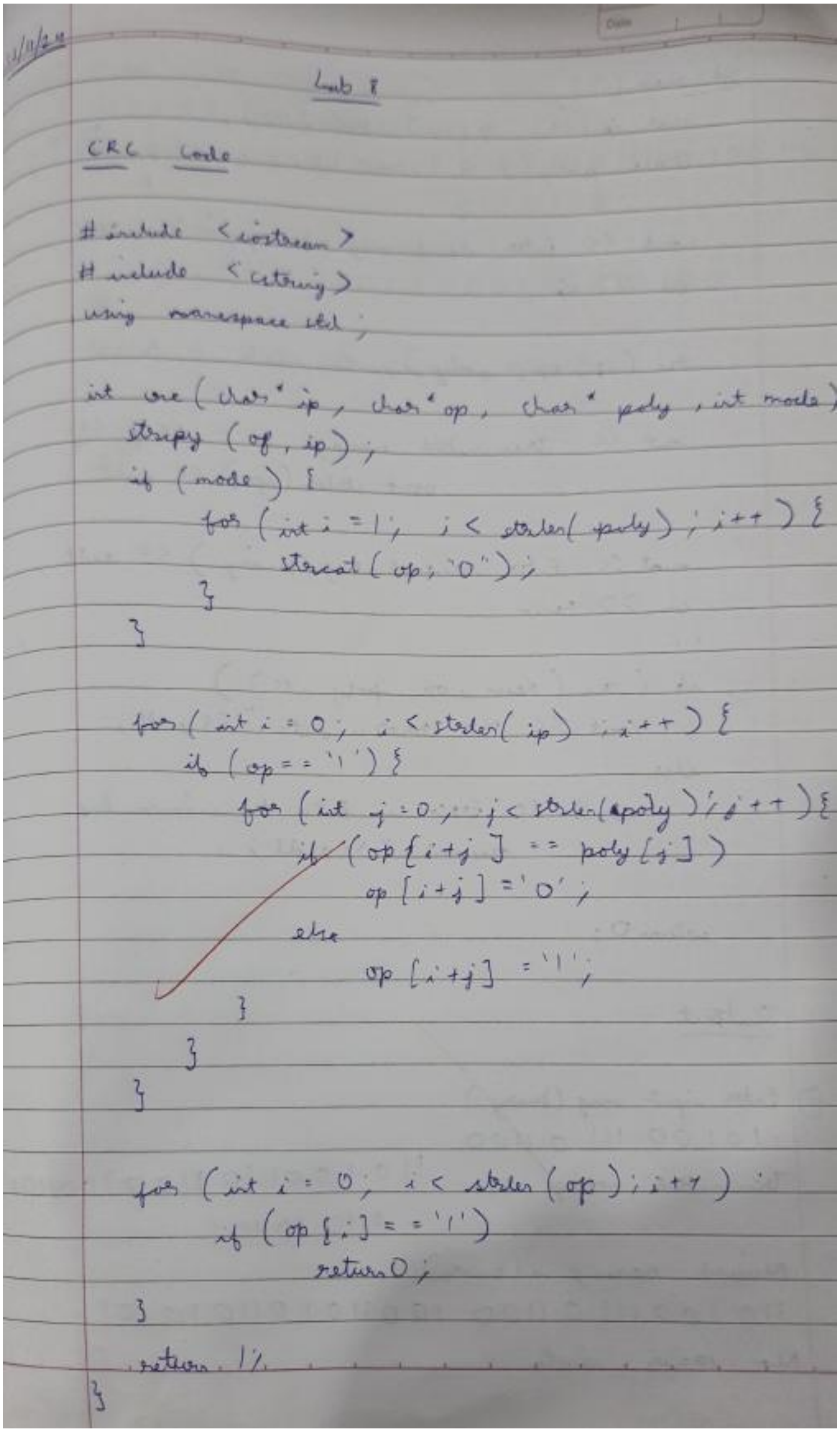


```
Enter the input message in binary:
11010011101100
The transmitted message is: 110100111011001001101011010101
Enter the received message in binary:
110100111011001001101011010101
No error in data

Process returned 0 (0x0)   execution time : 128.092 s
Press any key to continue.
```



```
Enter the input message in binary:
11010011101100
The transmitted message is: 110100111011001001101011010101
Enter the received message in binary:
110100111011001001101011010100
Error in data transmission has occurred

Process returned 0 (0x0)   execution time : 11.272 s
Press any key to continue.
```

iv. Observation

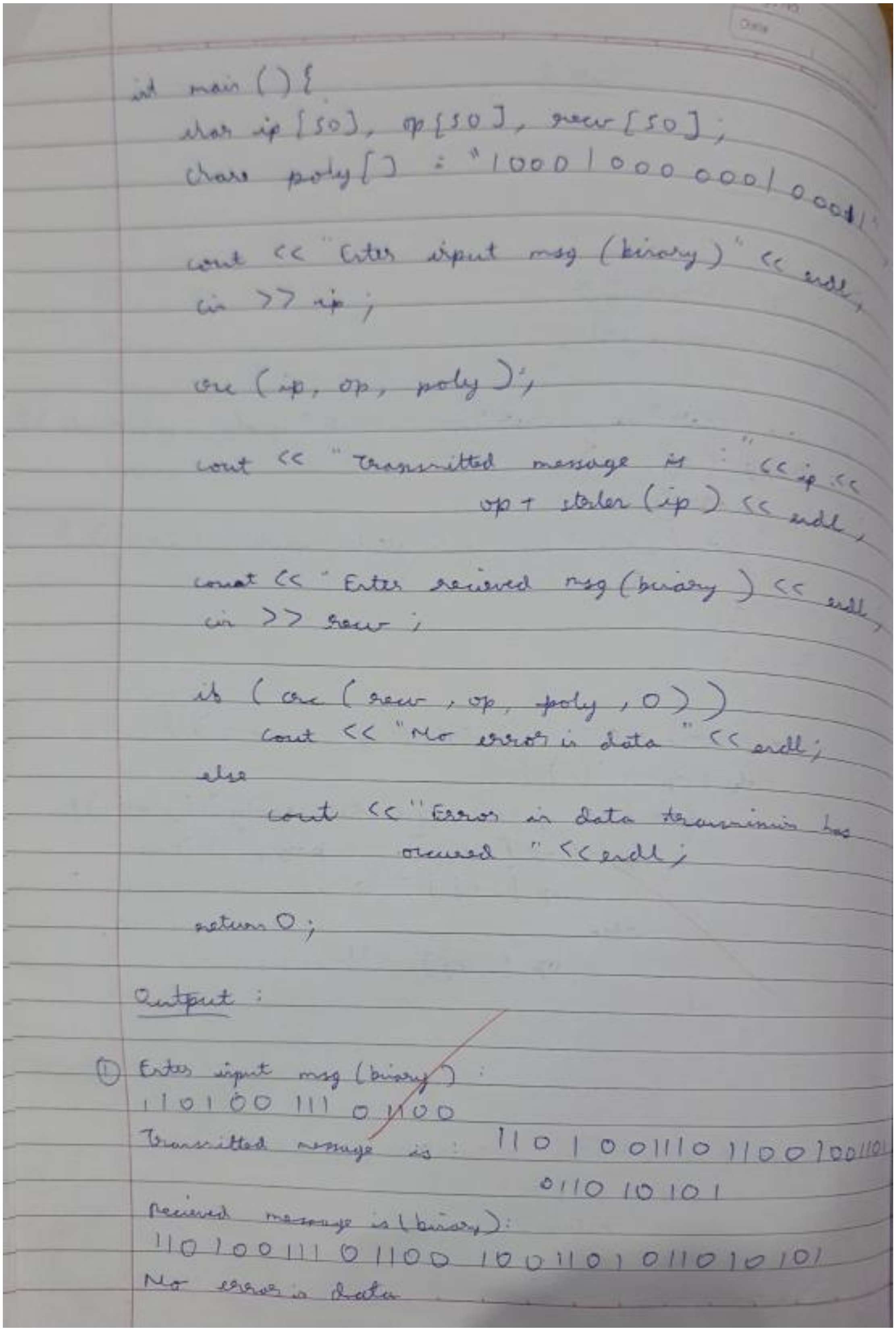


/11/21

Lab 8

CRC Code

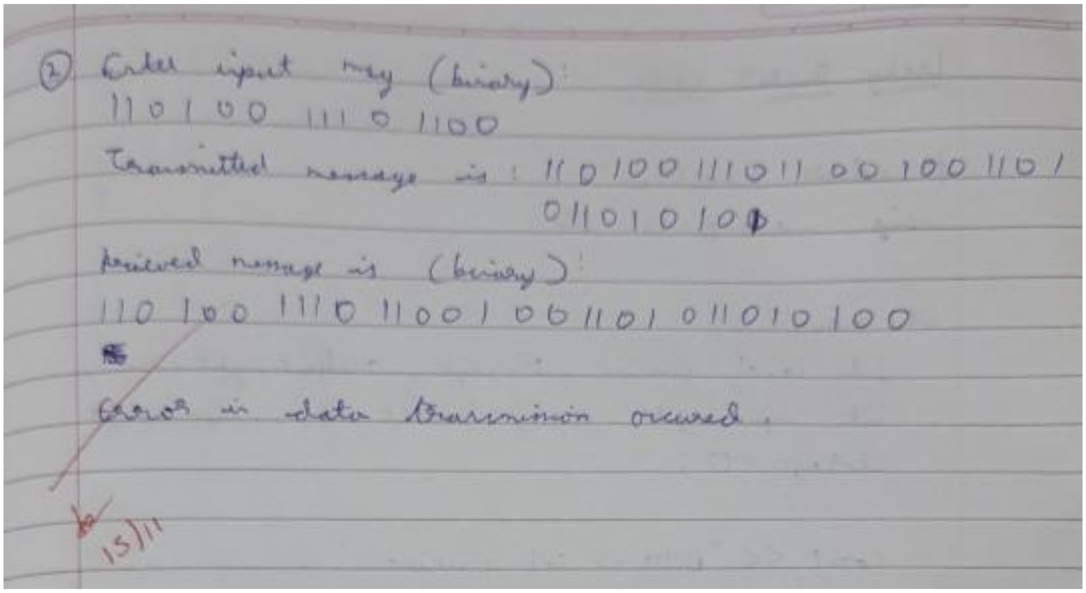
```
#include <iostream>
#include <cstring>
using namespace std;

int crc (char* ip, char* op, char* poly, int mode)
   strcpy (op, ip);
   if (mode) {
        for (int i = 1; i < strlen( poly) ; i++ ) {
             strcat ( op, "0");
        }
   }

   for ( int i = 0; i < strlen( ip) ; i++ ) {
      if (op == '1') {
           for (int j = 0; j < strlen(poly); j++ ){
                if (op[i+j] == poly[j])
                     op [i+j] = '0';
                else
                     op [i+j] = '1';
           }
      }
   }

   for (int i = 0; i < strlen (op); i++ )
        if (op[i] == '1')
             return 0;
   }
   return 1;
}
```



```
int main () {
    char ip [50], op [50], recv [50];
    chars poly [] : "1000 1 000 000 1 0 0001";

    cout << "Enter input msg (binary)" << endl;
    cin >> ip;

    crc (ip, op, poly);

    cout << "Transmitted message is : " << ip <<
                        op + strlen (ip) << endl;

    couat << " Enter recieved msg (binary ) << endl;
    cin >> recv ;

    if ( crc ( recv , op, poly , 0 ) )
        cout << "No error in data " << endl;
    else
        cout << "Error in data transmission has
                    occured " << endl;

    return 0;
```

Output :

```
① Enter input msg (binary) :
11010011101100
Transmitted message is :  1101 0011101100 1001101
                          0110 10101
Recieved message is (binary):
11010011101100 1001101 0110 10101
No error in data
```



② Enter input msg (binary):
110100 1110 1100
Transmitted message is: 110100 111011 00100 1101
011010100.
Received message is (binary):
110 100 1110 11001 001101 011010100

Error in data transmission occured.

15/11

Program 14

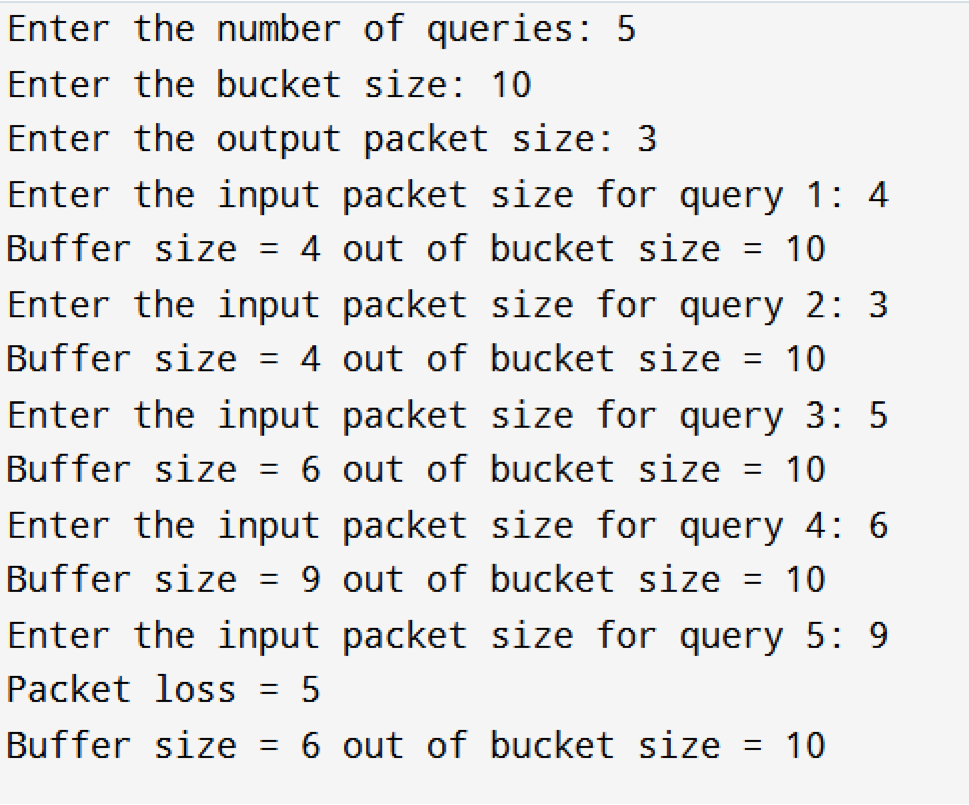
i. Aim of the program

Write a program for congestion control using Leaky bucket algorithm.

ii. Procedure along with the topology

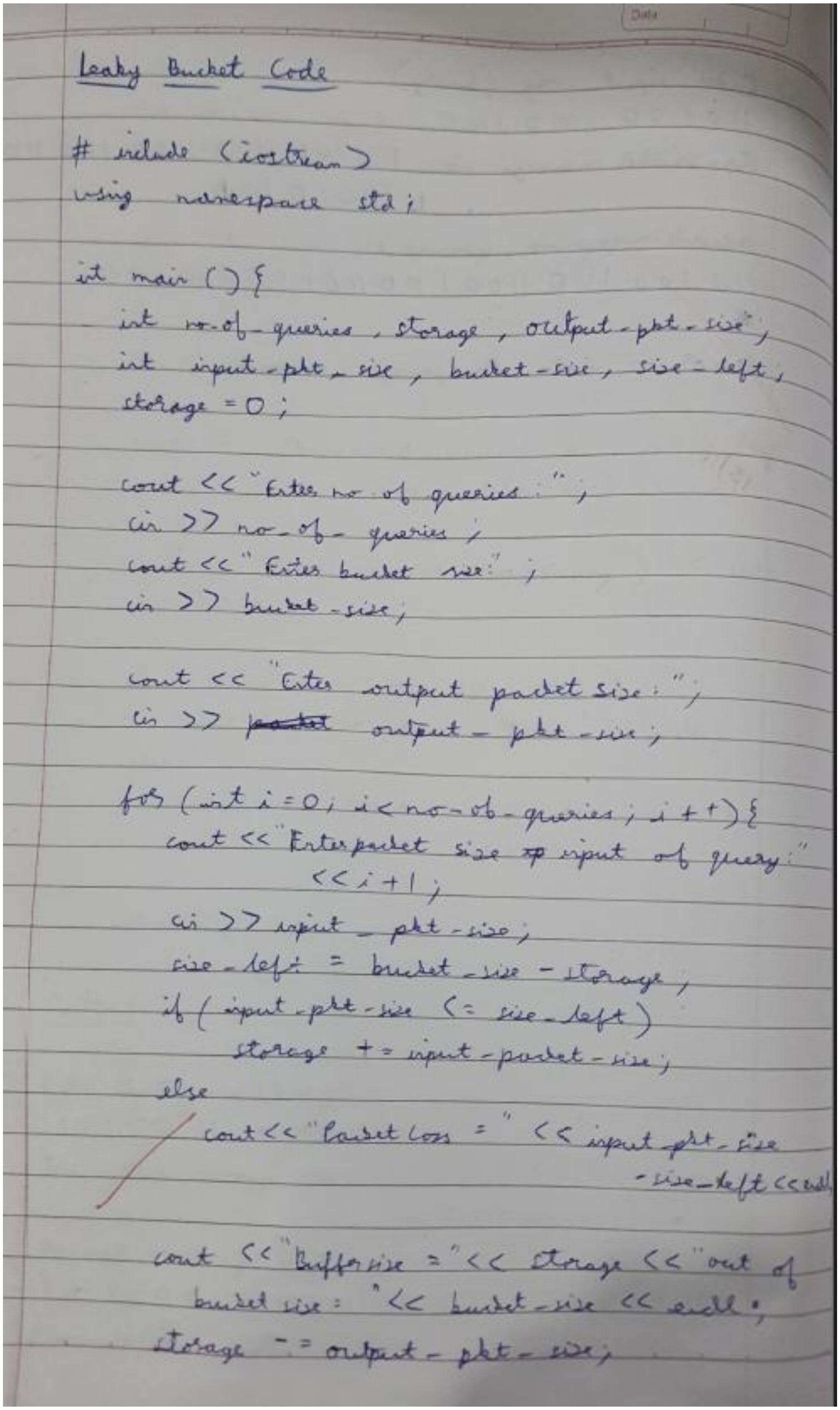
```
#include <bits/stdc++.h>
using namespace std;

int main() {
    int no_of_queries, storage, output_pkt_size;
    int input_pkt_size, bucket_size, size_left;

    // Initial packets in the bucket
    storage = 0;

    // Total number of times bucket content is checked
    cout << "Enter the number of queries: ";
    cin >> no_of_queries;

    // Total number of packets that can be accommodated in the bucket
    cout << "Enter the bucket size: ";
    cin >> bucket_size;

    // Number of packets that exit the bucket at a time
    cout << "Enter the output packet size: ";
    cin >> output_pkt_size;

    // Iterating for each query
    for (int i = 0; i < no_of_queries; i++) {
        // Get the input packet size for the current query
        cout << "Enter the input packet size for query " << i + 1 << ": ";
        cin >> input_pkt_size;

        // Calculate the space left in the bucket
        size_left = bucket_size - storage;

        if (input_pkt_size <= size_left) {
            // If there is enough space, add the input packets to the storage
            storage += input_pkt_size;
        } else {
            // If there is not enough space, packet loss occurs
            cout << "Packet loss = " << input_pkt_size - size_left << endl;
        }
        // Print current buffer size
        cout << "Buffer size = " << storage << " out of bucket size = " << bucket_size << endl;

        // Simulate output packet consumption
        storage -= output_pkt_size;

        // Ensure the storage does not become negative
        if (storage < 0) {
            storage = 0;
        }
    }

    return 0;
}
```

iii. Screen shots/ output



```
Enter the number of queries: 5
Enter the bucket size: 10
Enter the output packet size: 3
Enter the input packet size for query 1: 4
Buffer size = 4 out of bucket size = 10
Enter the input packet size for query 2: 3
Buffer size = 4 out of bucket size = 10
Enter the input packet size for query 3: 5
Buffer size = 6 out of bucket size = 10
Enter the input packet size for query 4: 6
Buffer size = 9 out of bucket size = 10
Enter the input packet size for query 5: 9
Packet loss = 5
Buffer size = 6 out of bucket size = 10
```

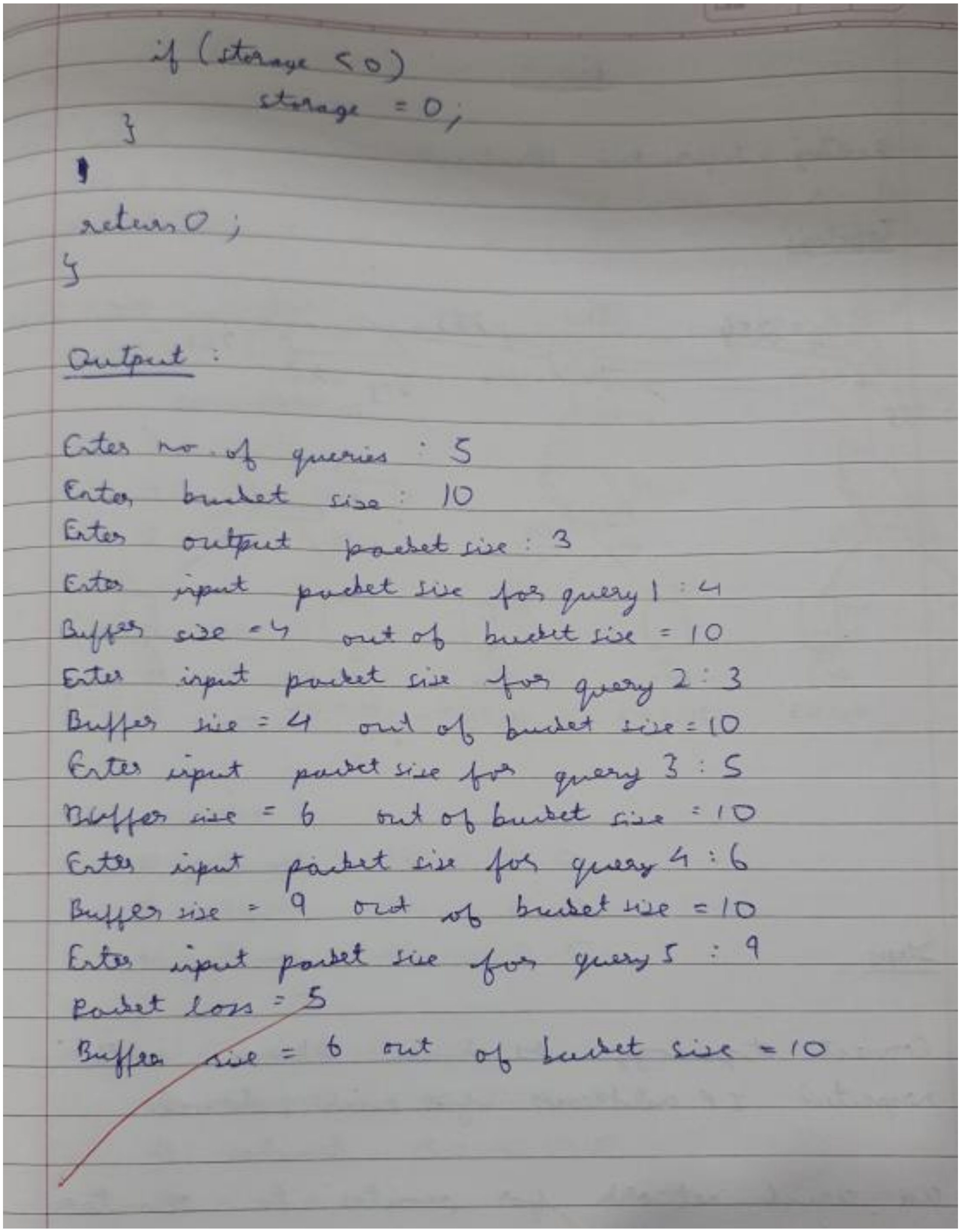
iv. Observation



Date

Leaky Bucket Code

```
# include <iostream>
using namespace std;

int main () {
   int no_of_queries, storage, output_pkt_size;
   int input_pkt_size, bucket_size, size_left;
   storage = 0;

   cout << "Enter no of queries : ";
   cin >> no_of_queries;
   cout << "Enter bucket size: ";
   cin >> bucket_size;

   cout << "Enter output packet size: ";
   cin >> ~~packet~~ output_pkt_size;

   for (int i = 0; i < no_of_queries; i++){
      cout << "Enter packet size ~~to~~ input of query:"
               << i+1;
      cin >> input_pkt_size;
      size_left = bucket_size - storage;
      if ( input_pkt_size <= size_left )
           storage += input_packet_size;
      else
        cout << "Packet Loss = " << input_pkt_size
                             - size_left << endl;

      cout << "Buffer size = " << storage << "out of
        bucket size : " << bucket_size << endl;
      storage -= output_pkt_size;
```



```
    if (storage < 0)
        storage = 0;
  }
}
return 0;
}
```

Output :

```
Enter no. of queries : 5
Enter bucket size : 10
Enter output packet size : 3
Enter input packet size for query 1 : 4
Buffer size = 4 out of bucket size = 10
Enter input packet size for query 2 : 3
Buffer size = 4 out of bucket size = 10
Enter input packet size for query 3 : 5
Buffer size = 6 out of bucket size = 10
Enter input packet size for query 4 : 6
Buffer size = 9 out of bucket size = 10
Enter input packet size for query 5 : 9
Packet loss = 5
Buffer size = 6 out of bucket size = 10
```

Program 15

i. Aim of the program

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.

ii. Procedure along with the topology

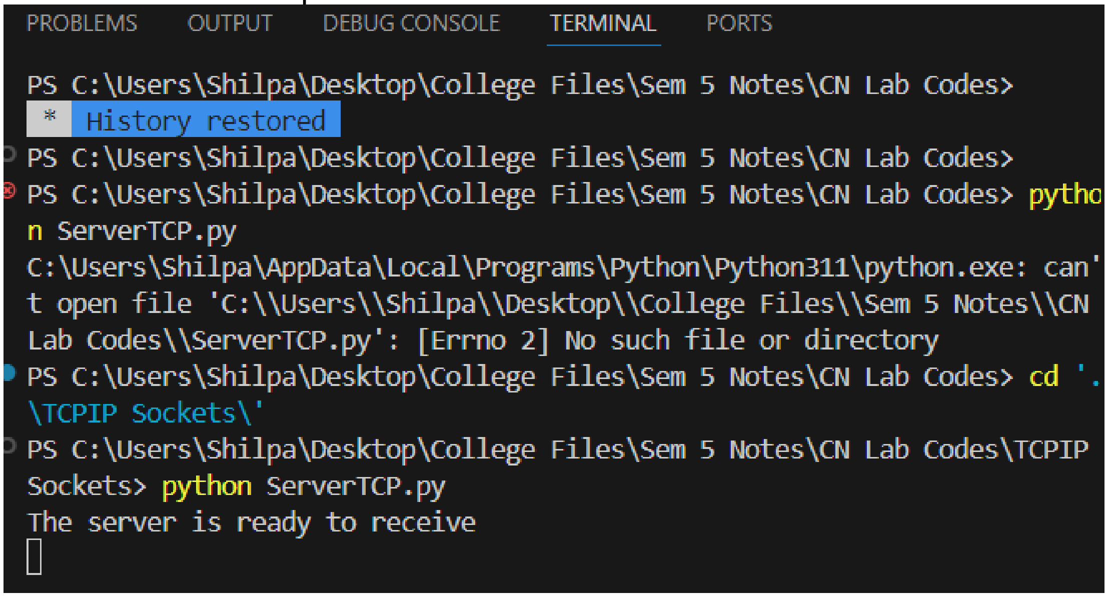
Client.py

```
from socket import *

serverName = "127.0.0.1"
serverPort = 12000

clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))

sentence = input("Enter file name: ")
clientSocket.send(sentence.encode())

filecontents = clientSocket.recv(1024).decode()
print('From Server:', filecontents)

clientSocket.close()
```

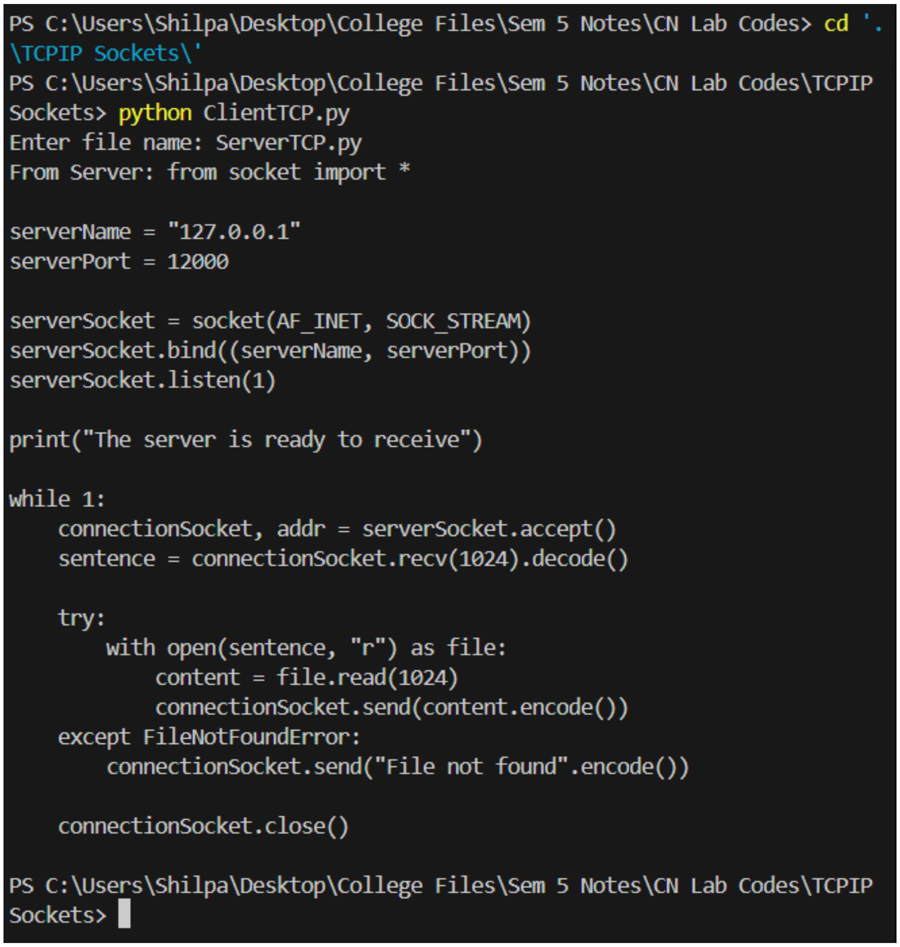
Server.py

```
from socket import *

serverName = "127.0.0.1"
serverPort = 12000

serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)

print("The server is ready to receive")

while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    try:
        with open(sentence, "r") as file:
            content = file.read(1024)
            connectionSocket.send(content.encode())
    except FileNotFoundError:
        connectionSocket.send("File not found".encode())
    connectionSocket.close()
```

iii. Screen shots/ output

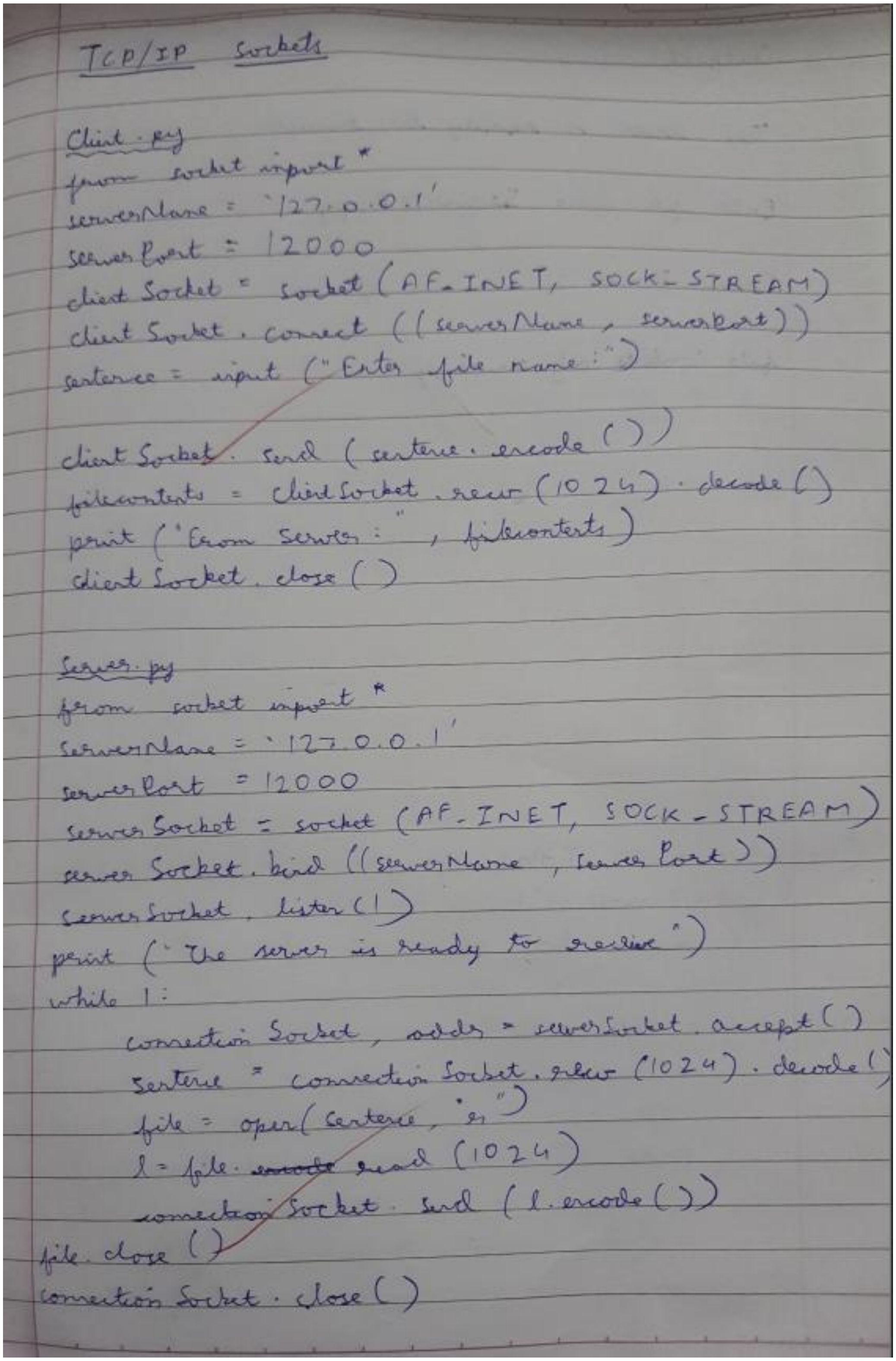


```
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes>
 *  History restored
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes>
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes> pytho
n ServerTCP.py
C:\Users\Shilpa\AppData\Local\Programs\Python\Python311\python.exe: can'
t open file 'C:\\Users\\Shilpa\\Desktop\\College Files\\Sem 5 Notes\\CN
Lab Codes\\ServerTCP.py': [Errno 2] No such file or directory
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes> cd '.
\TCPIP Sockets\'
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes\TCPIP
Sockets> python ServerTCP.py
The server is ready to receive
▯
```



```
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes> cd '.
\TCPIP Sockets\'
PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes\TCPIP
Sockets> python ClientTCP.py
Enter file name: ServerTCP.py
From Server: from socket import *

serverName = "127.0.0.1"
serverPort = 12000

serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)

print("The server is ready to receive")

while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    try:
        with open(sentence, "r") as file:
            content = file.read(1024)
            connectionSocket.send(content.encode())
    except FileNotFoundError:
        connectionSocket.send("File not found".encode())

    connectionSocket.close()

PS C:\Users\Shilpa\Desktop\College Files\Sem 5 Notes\CN Lab Codes\TCPIP
Sockets> █
```

iv. Observation



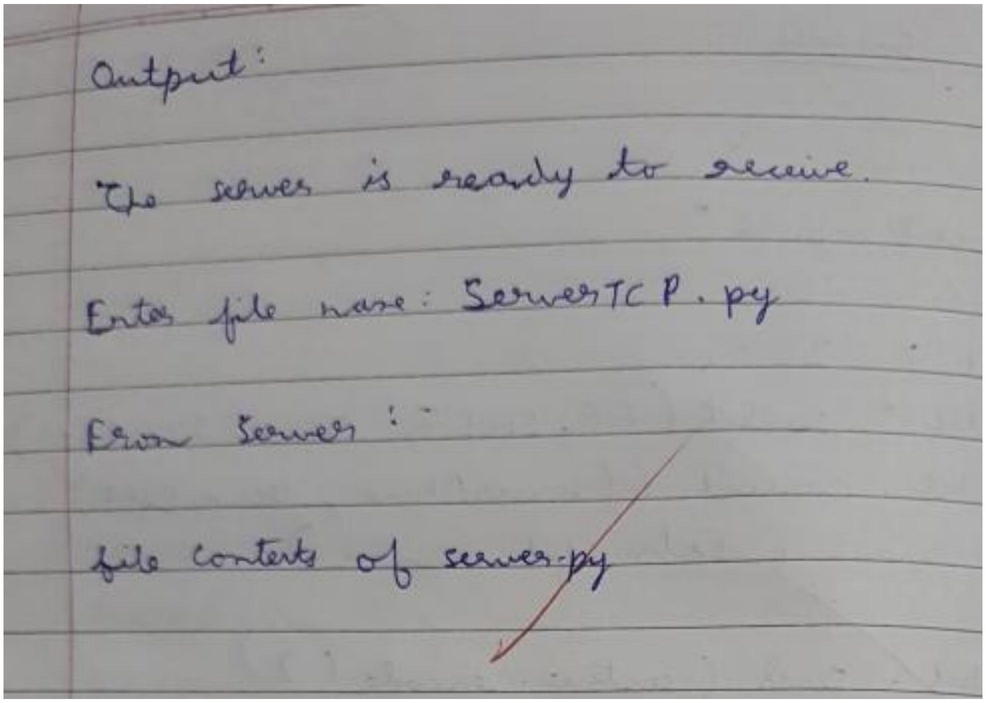
TCP/IP Sockets

Client.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))
sentence = input("Enter file name:")

clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print("From Server:", filecontents)
clientSocket.close()
```

Server.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)
print('The server is ready to receive')
while 1:
        connectionSocket, addr = serverSocket.accept()
        sentence = connectionSocket.recv(1024).decode()
        file = open(sentence, 'r')
        l = file.~~encode~~ read(1024)
        connectionSocket.send(l.encode())
file.close()
connectionSocket.close()
```



Output:

```
The server is ready to receive.

Enter file name: ServerTCP.py

From Server:-

file contents of server.py
```

Program 16

i. Aim of the program

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.

ii. Procedure along with the topology

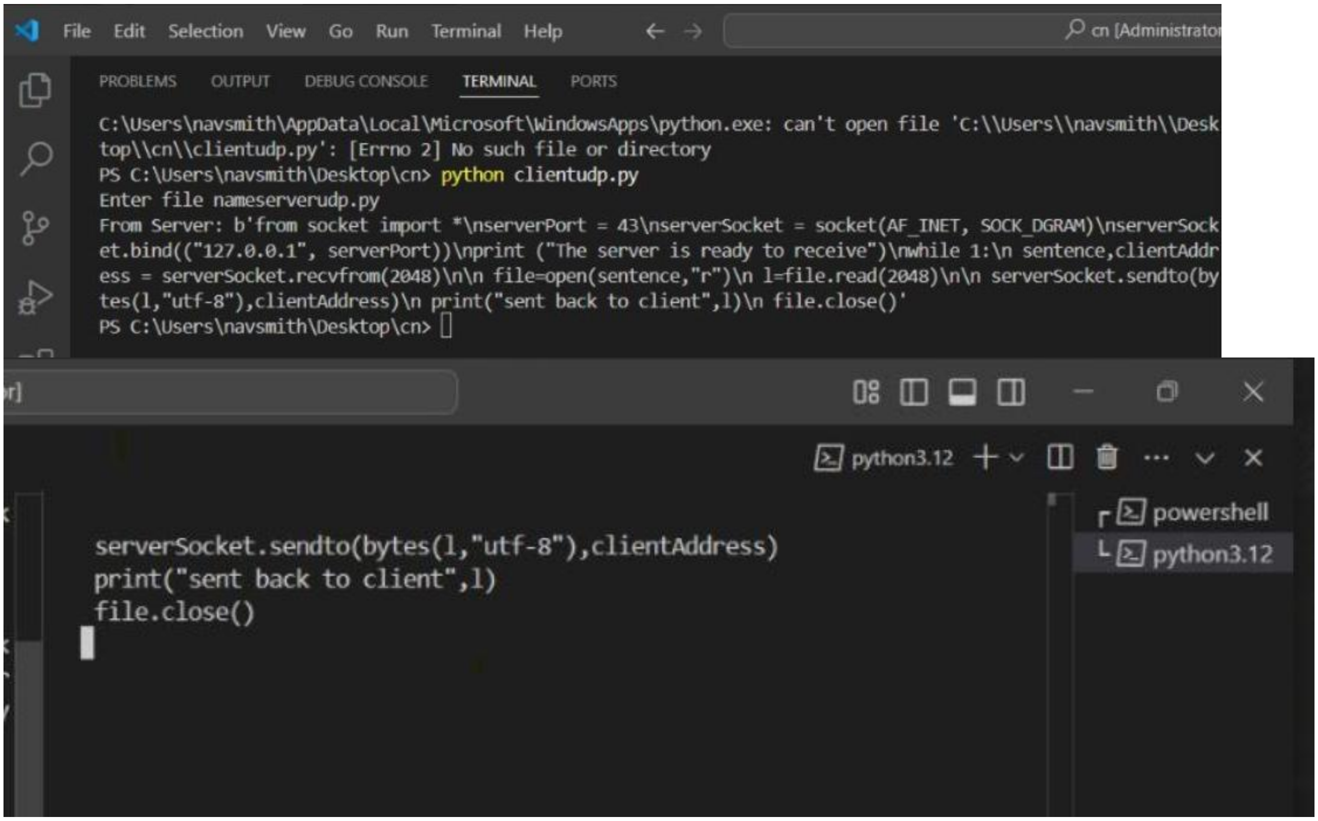
Client.py

```
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"), (serverName, serverPort))

filecontents, serverAddress = clientSocket.recvfrom(2048)
print('From Server:', filecontents.decode())

clientSocket.close()
```

Server.py

```
from socket import *

serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)

serverSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")

while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)

    try:
        with open(sentence.decode(), "r") as file:
            l = file.read(2048)
            serverSocket.sendto(bytes(l, "utf-8"), clientAddress)
            print("Sent back to client:", l)
    except FileNotFoundError:
        serverSocket.sendto(bytes("File not found", "utf-8"), clientAddress)
        print("File not found:", sentence.decode())
```

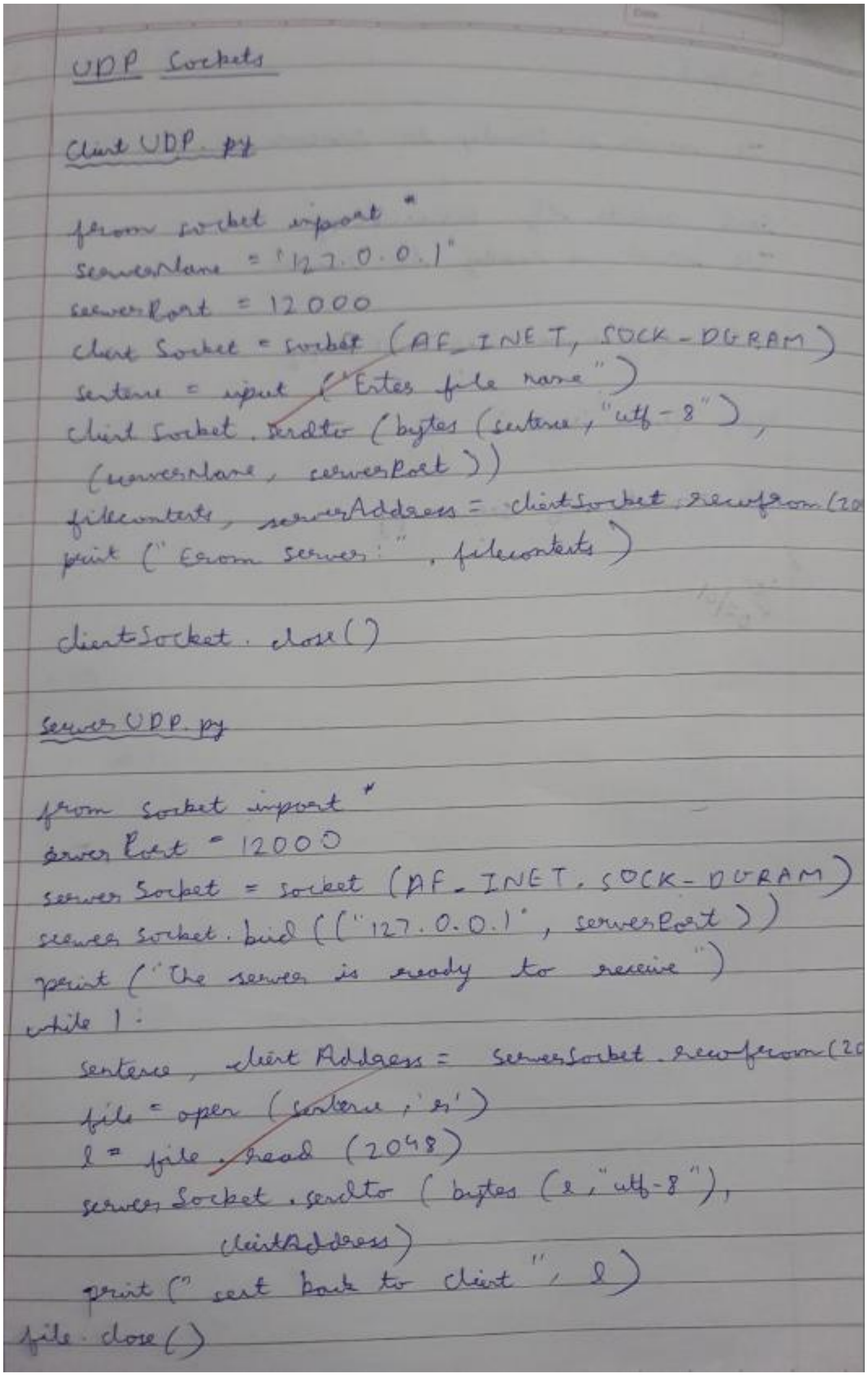
iii. Screen shots/ output


File
Edit
Selection
View
Go
Run
Terminal
Help
cn [Administrator
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
python3.12
powershell
python3.12

```
C:\Users\navsmith\AppData\Local\Microsoft\WindowsApps\python.exe: can't open file 'C:\\Users\\navsmith\\Desk
top\\cn\\clientudp.py': [Errno 2] No such file or directory
PS C:\Users\navsmith\Desktop\cn> python clientudp.py
Enter file nameserverudp.py
From Server: b'from socket import *\nserverPort = 43\nserverSocket = socket(AF_INET, SOCK_DGRAM)\nserverSock
et.bind(("127.0.0.1", serverPort))\nprint ("The server is ready to receive")\nwhile 1:\n sentence,clientAddr
ess = serverSocket.recvfrom(2048)\n\n file=open(sentence,"r")\n l=file.read(2048)\n\n serverSocket.sendto(by
tes(l,"utf-8"),clientAddress)\n print("sent back to client",l)\n file.close()'
PS C:\Users\navsmith\Desktop\cn> 
```

```
serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
print("sent back to client",l)
file.close()
```

iv. Observation



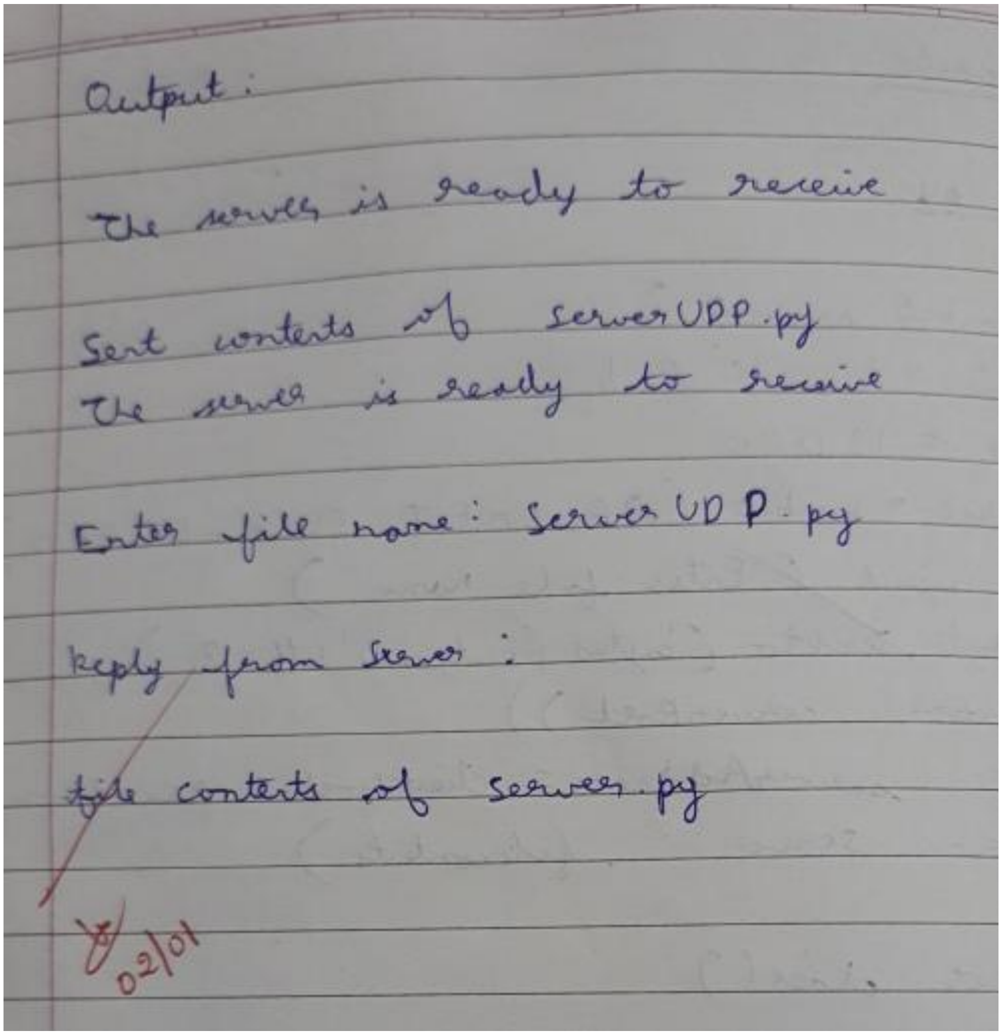
UDP Sockets

Client UDP.py

```
from socket import *
serverName = '127.0.0.1"
serverPort = 12000
clientSocket = socket (AF_INET, SOCK-DGRAM)
sentence = input ("Enter file name")
clientSocket.sendto (bytes (sentence, "utf-8"),
 (serverName, serverPort))
filecontents, serverAddress = clientSocket.recvfrom(20
print ("From server:", filecontents)

clientSocket.close()
```

Server UDP.py

```
from socket import *
serverPort = 12000
serverSocket = socket (AF_INET, SOCK-DGRAM)
serverSocket.bind (("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
    sentence, clientAddress = serverSocket.recvfrom(20
    file = open (sentence, 'r')
    l = file.read (2048)
    serverSocket.sendto ( bytes (l, "utf-8"),
              clientAddress)
    print (" sent back to client", l)
file.close()
```



Output:

```
The server is ready to receive

Sent contents of serverUDP.py
The server is ready to receive

Enter file name: ServerUDP.py

Reply from Server:

file contents of server.py
```

02/01